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VOL. 23. Ser. A. Part 4.—pp. 153–216. APRIL, 1935.

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*Vol. LXX (LITERATURE OF 1933).*

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MARSHALL (Sir G. A. K.). **New injurious Curculionidae (Col.) from Tanganyika.**—*Bull. ent. Res.* **25** pt. 4 pp. 495–500, 2 figs. London, December 1934.

The new species described are *Sphrigodes globulus*, defoliating ground-nuts and *Sesamum*, *S. crinitus* on *Sesamum indicum*, *Isaniris centropus* on coffee, *Systates alticollis* on ground-nuts, *S. annulatus* on tea, *S. minimus* on butter beans, and *Goniorrhinus terrenus* on cotton. *Phacemastix picta*, Hesse, which attacks *Sesamum*, and also occurs in South and South West Africa, is recorded from Tanganyika Territory.

GLOVER (P. M.). **The Developmental Stages of *Bracon tachardiae*, Cam. (Hym.).**—*Bull. ent. Res.* **25** pt. 4 pp. 521–539, 7 figs., 5 refs. London, December 1934.

*Microbracon* (*Bracon*) *tachardiae*, Cam., is an ectoparasite of the larva of *Eublemma amabilis*, Moore, which is a predator of major importance on lac, *Laccifer lacca*, Kerr, in India. The egg, the five larval instars, cocoon, prepupa and pupa of this Braconid are described. The males are on an average smaller than the females in the larval, pupal and adult stages. It is shown that the five larval instars may be grouped by the widths of the head capsule or the lengths of the mandibles, particularly if only averages are considered. The ratios of increase of head-width and of mandibular length are similar, so that provided one ratio is known, and either the head-width or mandibular length for one instar is known, it is possible to state approximately the average mandibular length and head-width of the remaining instars. Preliminary investigations indicated that similar results may be obtained with *Aphrastobracon flavipennis*, Ashm., which is normally an ectoparasite of *Eublemma scitula*, Ramb., but can also be bred from *E. amabilis*.

MYERS (J. G.). **The Arthropod Fauna of a Rice-ship, trading from Burma to the West Indies.**—*J. Anim. Ecol.* **3** no. 2 pp. 146–149, 1 ref. London, November 1934.

An annotated list is given of 40 Arthropods collected during a 13 days' voyage from Trinidad to Cuba on a ship carrying a cargo of rice from Calcutta and Rangoon. The insects associated with the rice were *Tenebroides mauretanicus*, L., *Ahasverus* (*Silvanus*) *advena*, Waltl, *Rhizopertha dominica*, F., *Tribolium castaneum*, Hbst., *Calandra* sp., and probably *Ephestia* sp. Adults of the last-named were observed in numbers, as were those of *Microbracon hebetor*, Say, which was presumably parasitic on it.

Numerous live adults of *Tribolium castaneum*, were found in the author's luggage 6 days after it had been landed in Cuba and after it had been taken to the other side of the Island.

BARNES (H. F.). **Studies of Fluctuations in Insect Populations. III. The Gall Midge, *Rhabdophaga heterobia* H. Lw., on Black Maul Variety of *Salix triandra* at Syston, Leicestershire, 1927–33.**—*J. Anim. Ecol.* **3** no. 2 pp. 165–181, 4 figs., 12 refs. London, November 1934.

This third paper [*cf. R.A.E.*, A **21** 368, etc.] on insect populations deals with studies on *Rhabdophaga heterobia*, H. Lw. [*cf.* **17** 404, etc.]

(536) Wt. P12/3603 1700 4/35 S.E.R. Ltd. Gp. 353. [A] 

on commercially grown basket willows (*Salix triandra*) in Leicestershire during 1927–33. Three broods a year were bred in an unheated greenhouse. The period in days from egg to adult recorded from summer broods, with the percentage standard error in brackets, averaged 41 (±3·93) and 35 (±3·73) in the first and second broods of 1929, and 40 (±1·65) and 44 (±1·83) in the corresponding broods of 1930; the minimum time was 33 and the maximum 48. In 1933, in two experiments only, the life-cycle in the first brood lasted 38 days. Adults from the same family do not all emerge at the same time, and the duration of flight varied from 4 to 29 days in different families, but it had no relation to the number of individuals in each. This variation results in an overlapping of the generations. Although all reproduction is sexual, unisexual families are the rule, but both sexes are found normally in a single gall, since more than one female oviposits in it. The variation in the numbers of antennal segments has been found to depend on the food supply of the larvae.

The Cecidomyiid and its parasites have been reared each year from samples each of 500 galls collected in the previous October–November; the total number of insects from one sample is presumed to be normally 3,000 individuals. In 1928, 1929 and 1932 there were approximately equal numbers of the midge and its parasites; after drought in the summer of 1929, which caused an early descent of sap and a consequent shortage of food for the midge and its parasites, the total number of insects per sample in 1930 was only about 1,000; in 1931 it was about 2,000; and in 1933, although the total number of individuals was normal, there was nearly twice the usual number of midges and just over a quarter the usual number of parasites. The proportion of males per sample decreased as the total number of midges increased.

The parasites that emerged in 1932 were *Aprostocetus ciliatus*, Nees, *Tetrastichus inunctus*, Nees, *Synopeas gallicola*, Kieff., and *Pseudotorymus medicaginis*, Mayr. In 1933 two further parasites, *Platygaster* sp. and *Inostemma walkeri*, Kieff., were reared. Except for 1933, the relative parasitism varied between 51 and 64 per cent. This differs from the large fluctuations in relative parasitism observed in other Cecidomyiids [**20** 484; **21** 368], but in these cases each successive brood was studied. Tables show the dates of emergence of *Rhabdophaga* and its parasites, and a comparison is instituted with *Dasyneura alopecuri*, Reut., [**21** 368] in respect to the relation between the dates of emergence and the extent of parasitism. It is suggested that the sudden increase in the numbers of *R. heterobia* and the decrease of its parasites in 1933 may possibly have been due to a reversal of the emergence dates in the previous generation; the peak of emergence of the parasites has usually been observed in the second or third week after that of the host. There was a definite increase in the emergence of *Rhabdophaga* in the laboratory the day after the tops of the samples had been sprayed with water. Daily conditions, especially temperature, seem to influence development and emergence to some extent, but the crest of emergence is nearly constant.

ROEBUCK (A.). **A General Account of the Pests on Willows at Syston, Leicestershire.**—*J. Anim. Ecol.* **3** no. 2 pp. 182–186, 1 fig., 1 pl. London, November 1934.

A survey of various insect pests of willow beds in Leicestershire showed that some species have a predilection for a certain species

of willow; thus *Phyllodecta vulgatissima*, L., only attacks *Salix viminalis* and *Rhabdophaga heterobia*, H. Lw., only *S. triandra*. Such natural phenomena as meteorological factors influence pests more than do parasites or direct control measures. The following were of outstanding importance: *Pterocomma* (*Melanoxantherium*) *salicis*, L., and *Aphis saliceti*, Kalt., which occur regularly on *S. triandra* and *S. purpurea* and are controlled by nicotine dusts; *Phyllodecta vulgatissima*, which was very numerous on *S. viminalis* after 1920 but was practically exterminated by summer rains in 1927 and 1930; *Galerucella lineola*, F., which first appeared in 1921 and would have completely defoliated about 30 acres of *S. triandra* in 1930 if rain had not destroyed practically all the larvae in July; and *Pontania proxima*, Lep., which reduced the lengths of the rods in 1926 and 1930, although in 1933 it was difficult to find galls of the first brood.

Certain species of *Rhabdophaga* [*cf. R.A.E.*, A **20** 443] mine in the rods of plants 2 and 3 years old, but the damage done by birds which prey on them is found more serious than that caused by the insects themselves. The larvae of *R. heterobia* are scattered on the ground by birds that split open the galls; and when the rods are sorted, numbers of the larvae shaken from the galls survive [*cf.* **17** 405]. Blocks left uncut for two or three years in order to produce longer rods also act as foci of infestation. Sometimes, as in 1929 and 1930, infestation spreads from the pitting dykes and from uncut blocks of willows until it is uniform over all the fields by the end of the season. It is suggested that if all *S. triandra* varieties could be cut and removed for preparation, a single winter accompanied by high floods would control this Cecidomyiid.

PARKIN (E. A.). **The Occurrence of the Longhorn Beetle, *Hylotrupes bajulus* L., in England.**—*Forestry* **8** no. 2 pp. 150–154, 1 pl., 2 refs. London, December 1934.

*Hylotrupes bajulus*, L., which is an important pest of soft woods in the Baltic States, has occasionally been recorded from timber out of doors in England. The females lay an average of 30–40 eggs, usually in cracks and crevices in the wood. The larvae hatch in about 14 days and live within the wood for about 4 years. The pupal period, passed in a chamber near the surface, occupies about 14 days. Attack only occurs in softwoods and starts in the sapwood, though the heartwood is not immune. Brief descriptions are given of the larvae and adults. The beetles have been occasionally obtained from structural timbers in England, particularly during 1920–25; they were presumed to have emerged from imported timbers. During this period, 3 instances of infestation of roof timbers in old buildings were recorded, but in each the infestation died out before repair work was started. A description is given of the inspection of 3 infested roofs of softwood in April and June 1934. No conclusion about the origins of these attacks could be reached, but there is no doubt that successful breeding is possible in seasoned softwood structural timbers in England and, moreover, that it is in progress in a number of buildings distributed over a wide area. In view of the quantities of softwoods now used in houses and other constructional work, the possibility of this Cerambycid spreading and causing extensive damage must not be overlooked.

Fisher (R. C.). **Duration of Life-cycle of the Death-watch Beetle.**— *Nature* **135** no. 3403 pp. 102–103, 1 ref. London, 19th January 1935.

In the course of work carried out in England during the last four years, *Xestobium rufovillosum*, DeG., has for the first time been reared from egg to adult in the laboratory. It is concluded that the length of the life-cycle in a suitable timber, such as oak or willow, depends upon temperature and the condition of the timber in respect of fungal decay and moisture content. At 20–25°C. [68–77°F.] and 18–20 per cent. moisture content (based on dry weight of wood), the beetle has been reared in 11 months in willow in an advanced stage of decay, but under the same conditions it has not yet completed development after 22 months in less decayed wood. At the same temperature but with less than 18 per cent. moisture content, the life-cycle required 28–30 months and longer in oak sapwood in varying stages of decay. It has been prolonged still further and has not yet been completed in decayed oak and willow under field conditions. Investigation of the relationship between the type and extent of fungal decay in timber and its susceptibility to attack indicate that the development of *Xestobium* in buildings is extremely slow unless conditions are unusually favourable to rapid decay.

Flachs (—). **Der Birnblasenfuss, ein neuer Obstbaumschädling in Bayern.** [The Pear Thrips, a new Fruit-tree Pest in Bavaria.]— *Prakt. Bl. Pflanzenb.* **12** no. 6 pp. 199–200. Freising, September 1934.

*Taeniothrips inconsequens*, Uzel, previously recorded in Germany from Prussia only, was observed in Bavaria in the spring of 1934 causing injury to the blossom buds of apple, some of which turned brown and died. The similarity of this injury to that by frost may explain why little attention has been paid to it. A brief account of the bionomics and control of this thrips is taken from the literature.

Börner (C.). **Beiträge zur Züchtung reblaus- und mehltaufester Reben. I. Vorbemerkung.** [Contributions on breeding Grape-vines resistant to *Phylloxera* and Mildew. I. Introduction.]
Börner (C.) & Schilder (F. A.). **II. Das Verhalten der Blattreblaus zu den Reben des Naumburger Sortiments.** [II. The Behaviour of the Leaf *Phylloxera* on the Vines of the Naumburg Class.]— *Mitt. biol. Reichsanst.* no. **49**, 84 pp., 4 pls. Berlin, October 1934.

The introductory paper discusses the lines on which it may be possible to approach the problem of breeding grape-vines resistant to *Phylloxera* and mildew. The second paper deals with the behaviour on different varieties of vine of the leaf-form of *Phylloxera*, which until 1927 was unknown in Germany [*R.A.E.*, A **21** 380], and records the experiments made in a series of tables. Possibilities of breeding seedlings that are resistant to this form appear to be confined to crossings that contain besides " riparia " only " cinerea," " berlandieri " or " rupestris."

V. D. PLASSCHE (A. W.). **De bestrijding van het spint in vruchtboomen in Zeeland.** [Measures against Mites on Fruit Trees in Zeeland.] —*Tijdschr. PlZiekt.* **40** no. 12 pp. 257–263. Wageningen, December 1934.

In the province of Zeeland *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.) infests apple and pear, while *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst) is generally found in greenhouses, but has also been observed in summer on plum trees. In tests of dormant sprays, the percentages of control obtained were 90 with mineral oil (Winter Volck), 70 with tar distillate, and 40 with 12 per cent. California mixture (lime-sulphur and salt [*cf. R.A.E.*, A **3** 215, 396]). In subsequent tests 20 per cent. California mixture was much inferior to mineral oil. The addition of nicotine to the oil gave no improvement.

PHAFF (S. K.). **De bestrijding van de bloedluis in Zeeland.** [Measures against the Woolly Aphis in Zeeland.]—*Tijdschr. PlZiekt.* **40** no. 12 pp. 264–272. Wageningen, December 1934.

An account is given of the bionomics of *Eriosoma lanigerum*, Hsm., in Zeeland, and of the control measures employed against it in Holland and other countries.

SCHOEVERS (T. A. C.). **De invoer, vestiging en verbreiding van het sluipwespje *Aphelinus mali* Say, parasiet van de bloedluis in Nederland.** [The Importation, Establishment and Spread in Holland of the Woolly Aphis Parasite, *A. mali*, Hald.]—*Tijdschr. PlZiekt.* **40** no. 12 pp. 273–278, 1 fig. Wageningen, December 1934.

*Aphelinus mali*, Hald., which was introduced into Holland by the author in 1924, is proving of considerable value in the control of the woolly aphis [*Eriosoma lanigerum*, Hsm.] on apple. It has maintained itself in some orchards for several years and has been widely distributed.

[YATZENTKOVSKIĬ (A. V.).] **Яцентковский (А. В.). Entomological Investigation of the Stands in the Siverskaya Forestry tapped for Purposes of Turpentine Production.** [*In Russian.*]—*Bull. Probl. For. Prot.* no. 2 pp. 84–105, 7 graphs, 5 refs. Leningrad, Goslestekhizdat, 1934. (With a Summary in English.)

This is a detailed account of three years' observations (1929–31) near Leningrad on the damage caused by insects, of which *Myelophilus* (*Blastophagus*) *piniperda*, L., *Pissodes piniphilus*, Hbst., and *Monochamus galloprovincialis*, Ol., were the most important, to pine trees tapped for resin. The period of tapping usually lasts for 5 consecutive years, after which the stand is cut down. Observations showed that tapping weakens the vitality of the trees so that the pests concentrate on them from adjoining plots. The percentage of tapped trees that were attacked by *M. piniperda* increased from 1·4 in 1929 to 9 in 1930 and 19·4 in 1931. In some of the stands, insects were responsible for the drying up of about 8 per cent. of the trees, trees of all sizes except the largest being affected. It is commonly considered that the drying up of infested trees in tapped stands is exclusively due to

various existing defects or diseases, but observations showed that this is not the case. In the course of the three years only 14 per cent. of the defective trees had dried up after tapping, and these had been killed by pests; and of the total number of tapped pines that had dried up as result of the infestation by pests, 60 per cent. were without any trace of defect. Experiments showed that thinning reduces the injury from pests, provided that it is the smaller trees that are removed; injury was completely prevented by removal of 50 per cent. of the trees in a stand.

The damage caused by insects in tapped stands is discussed. Primary pests that destroy the needles impair the circulation of the sap and so affect the yield of resin. By tunnelling in the cambium, bark-beetles cause loss of resin by exudation and sometimes kill trees that would otherwise have continued to yield it. The dry trees are often only suitable for use as fuel; it is estimated that in the Russian Union pests in stands that have been tapped for three years have rendered over 2,000,000 cu. yds. of wood unsuitable for any other purpose. Control measures recommended are felling and barking all infested trees that have ceased to yield resin; thinning tapped stands by removing trees of the low crown class; and exposing trap logs in the forest adjoining them and keeping it clear of all rubbish, fallen trees, etc. Trees should not be tapped if they are near uncleared felled areas or forests damaged by fire or wind, from which secondary pests can spread for distances of upwards of a mile.

[Flerov (B. V.).] **Флеров (Б. В.). Expediency of removing Bark from Pine Stumps in Cutting Areas of the Leningrad Region.** [*In Russian.*]—*Bull. Probl. For. Prot.* no. 2 pp. 106–134, 2 graphs, 4 refs. Leningrad, Goslestekhizdat, 1934. (With a Summary in English.)

In the course of investigations in 1929–31 on the control of *Hylobius abietis*, L., in a severely infested locality in the Department of Leningrad, it was found that barking pine stumps is of no value for its control. There was no difference in the degree of infestation of the unbarked stumps and those that had been barked in winter, and it was only reduced by 30–35 per cent. in stumps barked in spring, even when the bark had been removed for some distance below the surface of the soil.

In 1932–33 similar observations in the same locality were made on *Myelophilus* (*Blastophagus*) *piniperda*, L., since this weevil breeds in the part of the stump that is above ground. Its economic importance, however, depends on the different conditions of individual forests. It was found that of the weevils in heavily infested stumps in certain uncleared felled areas, only 8–59 per cent. represented a new brood, so that under certain conditions the presence of unbarked stumps does not favour an increase of the total "reserve" of the species in the forest and may even decrease it. The trees are seldom felled as close to the ground as they should be, and the stumps are often 1 ft. and sometimes over 2 ft. high. Owing to the winter cover of snow they can only be efficiently barked in spring, and in actual practice 20–50 per cent. of the bark is left on them. It was found that stumps of the summer felling (June–August) are not infested by *Myelophilus*, and those of the autumn felling are only slightly attacked in the following spring, whereas stumps of the spring and

winter felling, if they are thick and more than 7 ins. high, may produce large numbers of young weevils.

The mother-galleries of *M. piniperda* are distributed more or less evenly over the whole stump, but most of the young beetles emerge from the lower part. Even from stumps barked in spring, 50–70 per cent. emerge, owing to a comparatively wide belt of the bark being left at the base of the stump. Examination of a number of stumps showed that 75–94 per cent. of those barked in spring and 50–100 per cent. of those left unbarked were infested and that in no case was the number of young weevils in the barked stumps decreased by more than 50 per cent. From these observations it is concluded that the barking of pine stumps is only justifiable economically when infestation by *M. piniperda* is severe and increasing rapidly and must be supplemented by other measures of forest sanitation.

KUTTER (H.). **Die Bekämpfung der Konservenerbsenschädlinge im st. gallischen Rheintal. Untersuchungsbericht 1934.** [Measures against Pests of Peas grown for Canning in the Rhine Valley in the Canton of St. Gall, Switzerland. Report of Investigations for 1934.]—*Landw. Jb. Schweiz.* **48** no. 10 pp. 1133–1172, 9 pls. Bern, 1934. (With a Summary in French.)

The reports for 1931–1932 and 1933 [*R.A.E.*, A **21** 374 ; **22** 366] are briefly summarised. The pea-weevil, *Sitona lineata*, L., was abundant in 1934, probably owing to the wet summer of the preceding year, but the dry weather in May and June should prevent its occurrence in such large numbers in 1935. If the growth of the pea plants is stimulated by top dressing with manure, supplemented by watering in dry weather, direct measures of control are seldom required, but rotenone sprays or dusts are recommended in case of need. Contrary to previous belief, the time of emergence of *Kakothrips pisivorus*, Westw. (*robustus*, Uzel), *Contarinia pisi*, Winn., and *Pirene graminea*, Hal., a parasite of the latter, is not constant, for in 1934 they appeared at least a fortnight earlier than usual, and as the plants were not yet in full blossom *K. pisivorus* collected on the young shoots, so that many plants failed to blossom. Favourable weather allowed the thrips to increase and spread considerably, and its early appearance resulted in a comparatively numerous second generation, the larvae of which were attacked by an endophagous Hymenopterous parasite. Spraying with nicotine-soap or proprietary insecticides reduced the number of thrips by about half, but about 75 per cent. of *Pirene graminea* were also destroyed. Trap-plants attracted large numbers of the thrips, but control by this means would be difficult. In tests it was very resistant to exposure to X-rays.

Other Thysanoptera, especially species of *Thrips* and *Frankliniella intonsa*, Tryb., also occurred on the plants, but are not regarded as pests.

The life-cycle of *P. graminea* follows that of its host, *C. pisi*. Some adults of the overwintering generation emerged early in June, and others early in July together with those of the first generation. Since 1932, parasitism has risen from 50 to 91 per cent., and the fact that in 1934 the Cecidomyiid rarely destroyed as much as one-fifth of the crop is attributed to this. The introduction of the Pteromalid into other areas infested by *C. pisi* should be possible. Attempts to

combat the latter with kainit were abortive, but ploughing, either in autumn or in spring, reduced infestation.

In an area heavily infested in 1931 by *K. pisivorus* few peas were grown in 1932 and none at all in 1933. When this area was again planted with peas in 1934, all the above pests were at first entirely absent and only occurred later in small numbers.

Nonell Comas (J.) & Bardia Bardia (R.). **El " Cadell " o Alacrán Cebollero** (*Gryllotalpa gryllotalpa*, **L.**). [The Mole-cricket, *G. gryllotalpa*.]—23 pp., 12 figs. Barcelona, Estac. Fitop. agríc., 1934.

In this popular pamphlet on *Gryllotalpa gryllotalpa*, L., the various known methods of control are reviewed. Experiments in Spain, confirming those of Malenotti [*R.A.E.*, A **20** 257], showed that zinc phosphide in baits of broken rice or maize was poisonous to poultry, while sodium fluosilicate was not, although it was very effective against the mole-cricket. Barium fluosilicate was quite as effective and even less poisonous to poultry, but is more costly.

Menozzi (C.). **Andamento delle infestioni entomatiche rilevate durante la campagna saccarifera 1934.** [The Course of Insect Infestations observed during the Sugar-beet Season in Italy in 1934.]—*Industr. saccar. ital.* **27** no. 12 reprint 10 pp., 4 figs. Genoa, December 1934.

The sowing of sugar-beet in northern Italy was delayed by rains falling during March and the first half of April, and *Chaetocnema tibialis*, Illig., *Gryllus desertus*, Pall., the mole-cricket [*Gryllotalpa gryllotalpa*, L.], *Pegomyia hyoscyami*, Panz., and, in loose sandy soil, *Agriotes* sp. attacked many young plants. In central Italy during the same period *C. tibialis* destroyed the seedlings on 1,200 acres, and in early June control, chiefly by collection of the adults, became necessary against *Conorrhynchus* (*Cleonus*) *mendicus*, Gyll., which infested about 3,500 acres, and *C.* (*Cleonus*) *luigionii*, Sol., which was less numerous. *Cassida vittata*, Vill., and *C. nobilis*, L., were not very harmful, since of the few larvae that appeared in June 50 per cent. in northern Italy and 30 per cent. in southern Italy were at once parasitised by *Tetrastichus bruzzonis*, Masi, and *Brachymeria vitripennis*, Först. A small infestation of *Laphygma exigua*, Hb., and *Agrotis ypsilon*, Hfn., was checked by a lead arsenate spray. A mite, previously recorded as *Tetranychus* sp. [*R.A.E.*, A **22** 202] and now identified as *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.), injured the peripheral leaves in August, but was attacked by a Coccinellid, *Stethorus punctillum*, Wse.

Beet grown for seed was damaged by *Euxoa segetum*, Schiff., *Lixus junci*, Boh., and *L. scabricollis*, Boh. [*loc. cit.*]. The larvae of *L. junci* mined the stems of the inflorescences, while those of *L. scabricollis* usually developed in the leaf-ribs. Females of *L. junci* oviposited from mid-April to the end of June. The adults of these species fed sparingly on the surfaces of beet stems, as they had already fed on various wild and cultivated chenopodiaceous plants and cultivated crucifers. At present the only possible measure is to destroy, after harvesting and especially after threshing, the flower-stems, which harbour the larvae and pupae. In central Italy *L. junci* was attacked

by 11 parasites, of which *Pimpla roborator*, F., *Microbracon intercessor*, Nees, *Picroscytoides cerasiops*, Masi, *Eurytoma curculionum*, Mayr, and *E. tristis*, Mayr, were the most important.

Experiments made with a contact dust against *Chaetocnema tibialis* and with trap-glasses containing a molasses bait against *Pegomyia hyoscyami* were sufficiently promising to justify future tests. The relation of *Conorrhynchus mendicus* to wild plants was investigated. In cultivated beet-fields, where this weevil normally has an annual life-cycle, the eggs are laid in July and adults emerge from September to December; but in unharvested and uncultivated plots many larvae do not pupate until March or April of the following year. It was found that several larvae could live in a slender root of *Beta maritima*, which is more resistant than sugar-beet, and that the larval diapause always occurs in *Beta maritima* and *Atriplex halimus*. A two-year cycle would therefore appear to be natural to *C. mendicus*.

McMartin (A.). **The Locust Fungus. Its Artificial Cultivation.**—*S. Afr. Sugar J.* **18** no. 9 pp. 521 & 523. Durban, 30th September 1934.

Failure to produce artificial cultures of *Empusa grylli* taken from dead locusts [*cf. R.A.E.*, A **22** 593] has been attributed to its nature as an obligate parasite, existing only on living insects. In recent experiments in Natal, however, growth of the fungus was obtained after several weeks on a solid medium and in a few days on a liquid one of maltose, glycerine and peptone. From these cultures transfers were made to other media. The appearance of the organism altered considerably with the nature of the medium and the temperature. Finally, some of the tubes were covered with a pure yeast-like growth. Examination of recently killed locusts revealed the presence of numerous yeast-like organisms in the body juices as the first symptoms of infestation by this fungus. After further cultural experiments and changes in the medium, the growth could be made to resemble that on the locust. *Empusa* is therefore not an obligate parasite, but may exist as a saprophyte. Spores left on sugar-cane after dead locusts drop to the ground might be able to grow, but the different appearance of the fungus would have prevented recognition. Cultures have also been made of three other fungi obtained from dead locusts in Natal, *viz.*, *Beauveria globulifera* and species thought to belong to the genera *Sporotrichum* and *Fusarium*. In a few cases infection of healthy locusts was obtained with cultures of the first two.

Fajardo (T. G.) & Bellosillo (G. C.). **A Mite Disease of Tomato, Tobacco, Potato, and other Plants in the Philippines.**—*Philipp. J. Sci.* **54** no. 4 pp. 523–543, 8 pls., 10 refs. Manila, August 1934. [Recd. January 1935.]

The names "top crinkle" or "necrosis" are proposed for a disease-like condition of tomato, potato, tobacco and other plants recently observed in greenhouses in the Philippines. The young leaves of the shoots and axillary buds dry up, the young plants are killed, and the older ones fail to develop flowers and young fruit. The same condition has also been observed in commercial plantations. Investigations begun in 1930 suggest that it is due to a mite, which is provisionally identified as *Tarsonemus translucens*, Green. The mites are most numerous on the lower surface of the leaves.

The following is largely taken from the authors' summary: *Ferrisiana* (*Ferrisia*) *virgata*, Ckll., a species of *Thrips* and a Tetranychid mite common in the greenhouse failed to produce the symptoms. Tomatos artificially infested with the Tarsonemid mites or exposed to natural infestation in the greenhouse showed bronze discolouration within 8–10 days and the typical " blighted top " in 12–15, and an increase in the number of mites hastened the appearance of the symptoms. The appearance of symptoms is delayed in cool, cloudy or rainy weather ; in the field they are not usually serious during the rains, with the result that the plants may recover and develop new healthy branches. Cross-infection experiments in the greenhouse and microscopical examination of the mites indicated that the symptoms on tomato, potato, pepper, dahlia and a variety of other plants are possibly due to the same mite.

In greenhouse tests with dahlia good results were obtained with sprays of nicotine sulphate (1–2 : 1,000) with soap, or particularly with lime-sulphur (33°Bé.) at dilutions of 1 : 75 or 1 : 100. Successful results were also obtained by fumigating the plants in air-tight chambers or under canvas for 5–15 minutes with calcium cyanide at the rate of about 1 teaspoonful or more cyanogas to 36 cu. ft. space.

VOÛTE (A. D.). **De djeroek-mineerrups** (*Phyllocnistis citrella* **St.**). [The Citrus Leaf-miner, *P. citrella*]—*Korte Meded. Inst. PlZiekt.* no. 19, 38 pp., 2 pls., 2 pp. refs. Buitenzorg, 1934. (With a Summary in English.) Price *Fl.*0·50.

The life-history of *Phyllocnistis citrella*, Stn., in Java [*R.A.E.*, A **21** 60], does not altogether agree with Clausen's record of it in Japan [**19** 649]. Its shorter life-cycle in Java, where the egg, larval and pupal stages lasted 4, 7 and 5 days, should probably be attributed to the warmer climate [*cf.* **22** 49]. Development would be slower in the mountain region, but the Tineid is seldom harmful at altitudes above 3,000 ft. The adults mated shortly after emergence and usually rested by day on plants or on the ground. The larvae caused serious injury to the seedlings of citrus and slight damage to the leaves of older trees. The mines sometimes gave entry to canker. Varieties of *Citrus* were the only observed food-plants, but other Rutaceae in the forest may be infested. *P. citrella* has not been bred in Java from *Loranthus* [*cf.* **10** 276], which is attacked by an allied species, *P. voutei*, Hering.

Of several larval parasites, *Ageniaspis* sp., the most important, sometimes parasitised over 80 per cent. of the larvae in the mines. The adults lived for 4–5 days in moist surroundings, but somewhat less in drier conditions. The egg and larval stages together lasted 4–5 days, and the pupal 16. *Cirrospilus* sp. oviposited in larvae that had spun their cocoons. The ectoparasitic larval stage lasted 3 days. A maximum parasitism of 50 per cent. was observed. *Microbracon* [*phyllocnistidis*, Mues. (**22** 128)] oviposited in the larva in its leaf-mine, and its larva left the host before it began to spin a cocoon. In one instance 73 per cent. of the pupal cases of the Tineid contained pupae of an unidentified parasite. The extent of parasitism, which was highest under shade, during the rainy season, and in the mountains, varied greatly during the year. A possible explanation of the higher degree of parasitism under shade may be that *Citrus* leaves grown in a moist atmosphere apparently have a thinner cuticle.

Covers of gauze or fine fabric have been used to protect the seedlings. Experiments with Bordeaux mixture, nicotine or lead arsenate sprays were inconclusive, but lead arsenate, which did not appear to harm the parasites, gave results that warrant further tests. Nursery beds should be under shade in order to encourage the parasites.

Chu (Joo-tso). **An Investigation on the Parasites of *Parnara guttatus* Brem. from Hangchow.** [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 34 pp. 662–663. Hangchow, 1st December 1934. (With a summary in English.)

During an investigation in Hangchow in 1933, 43–86 per cent. of the larvae and pupae of *Parnara guttata*, Brem., were parasitised. The parasites obtained were *Xanthopimpla punctata*, F., *Apanteles baoris*, Wlkn., *Brachymeria obscurata*, Wlk., *Sympiesis* sp., *Pleurotropis* sp., *Zenillia roseanae*, B. & B., and *Sturmia* (*Argyrophylax*) *nigritibialis*, Baranov.

Fowler (R.). **The Use of chemically treated corrugated Bands as a supplementary Control for Codlin Moth.**—*J. Dep. Agric. S. Aust.* **38** no. 4 pp. 453–456. Adelaide, November 1934.

Experiments were first carried out with corrugated cardboard bands treated with beta-naphthol (dissolved in oil) against the codling moth [*Cydia pomonella*, L.] in South Australia in 1932–33, and as the result of further work in 1933–34, they are recommended for use in commercial orchards [*cf. R.A.E.*, A **20** 403]. They should be placed round the trees about mid-December when the first brood larvae are leaving the fruit, and removed and destroyed at the end of May or beginning of June. It is estimated that they kill at least 50 per cent, of the larvae, and when used in successive seasons, they should assist materially in reducing populations, particularly where only sprays are used because of the cost of examining untreated bands. Bands removed from the trees in 1932–33 contained large numbers of dead individuals of the woolly aphis [*Eriosoma lanigerum*, Hsm.], evidently caught while migrating to the roots for the winter ; there were not so many during 1933–34 as *Aphelinus mali*, Hald., had been numerous. The price of the bands prohibits their very extensive use, but it appears that a considerable reduction may be possible. The method of preparing them [*loc. cit.*] is described.

Fowler (R.). **Codlin Moth Control. Results of Experiments at Blackwood, 1933–34.**—*J. Dep. Agric. S. Aust.* **38** no. 4 pp. 460–468, 2 graphs. Adelaide, November 1934.

When summer oils were applied in South Australia against the codling moth [*Cydia pomonella*, L.] on apples after at least 2 sprays of 4 lb. lead arsenate and $\frac{1}{2}$ lb. calcium caseinate to 100 gals. water in various programmes comprising a total of 5 applications, good results were obtained whether the oils were used in combination with 4, 3 and 2 lb. lead arsenate sprays, alone at the rate of 1 : 60, alternately with the arsenical, or as a final spray at the rate of $\frac{3}{4}$ gal. to 100 gals. water with nicotine sulphate (1 : 1,600). None of the programmes reduced the arsenical residue below the export tolerance of 0·01 grains arsenic trioxide per lb., but they were all economically sound. Reduced

quantities of lead arsenate with white oil (*e.g.*, 2 lb. and ¾ gal. to 100 gals.) were used without loss of efficiency. White oils combined with lead arsenate or used following or alternatively with it did not appear to give significantly better control. Experiments with bait traps indicated that there are probably 2 broods, with peaks of emergence occurring about 11th December and 26th February; further experiments in which traps covered with wire netting contained an average for the season of 51·5 moths each, whereas those left uncovered contained only 20·6, suggest that birds may remove the moths and so interfere with the accuracy of baits for determining the proper time to spray.

Veitch (R.). **Report of the Chief Entomologist.**—*Rep. Dep. Agric. Stk Qd 1933–34* pp. 63–67. Brisbane, 1934.

Promising results were obtained in Queensland during 1933–34 with a spray of nicotine sulphate [*R.A.E.*, A **23** 116] and white oil applied as a repellent against *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.), on apples. Moreover 93·9 per cent. of the apples on trees treated with this spray were free from infestation by the codling moth [*Cydia pomonella*, L.] [*cf.* **21** 570], as compared with 84·6 per cent. on those treated with lead arsenate and 25·6 per cent. on untreated ones. *Lecanium* sp. was abundant on grape-vines, but caused comparatively little damage and was readily controlled with oil sprays during the dormant period. Outbreaks of *Leptoglossus bidentatus*, Montr., occurred in autumn in numerous *Citrus* orchards on the coast. The adult bugs settled in enormous numbers on comparatively few of the trees, causing serious loss of the fruit. About 70 per cent. were killed by the spray of resin, caustic soda and fish-oil [**19** 714]. It was also found that large numbers could be dislodged from the trees and collected in the early morning when the temperature was low. Breeding has not been observed on *Citrus*, but all stages have been found on cucurbits and passifloraceous plants. *Scirtothrips signipennis*, Bagn., was not so injurious to bananas as in the previous year but still caused appreciable losses. The value of nicotine dusts was further confirmed [*cf.* **22** 264]. In some southern areas cotton was heavily infested by *Heliothis obsoleta*, F., in summer. The occurrence of *Phthorimaea operculella*, Zell., on tobacco appeared to be related to the cultivation of potatoes. In one instance 5–6 plantings of tobacco seedlings failed to produce a satisfactory crop. Many old plants were destroyed during the winter of 1933 to reduce infestation by this pest and by *P. heliopa*, Lw. *Lasioderma serricorne*, F., has greatly increased in numbers owing to the storage of much unsold leaf. Soils of pastures heavily infested with white grubs had a high acid reaction. Buttons, probably of vegetable ivory, have been almost completely destroyed by the Scolytid, *Coccotrypes dactyliperda*, F. About 20 thousand individuals of the Trypetid *Euaresta aequalis*, Lw., were introduced from Kansas and liberated in areas infested with the Noogoora burr [*Xanthium pungens*] [*cf.* **19** 748; **22** 224, etc.].

Dumbleton (L. J.). **Note on Pear Midge Parasite.**—*N.Z.J. Sci. Tech.* **16** no. 3 pp. 163–164, 4 refs. Wellington, N.Z., November 1934.

The species of *Misocyclops* studied in France [*R.A.E.*, A **16** 154] and introduced into New Zealand [**17** 61, etc.] as a parasite of the pear

midge [*Dasyneura pyri*, Bch.] was identified as *M. marchali*, Kieff. [**15** 462], but its embryonic and larval development differs from that of *M. marchali* as described by Marchal (1906) and is identical with that of *M. ornatus*, Kieff.

During October–December 1933 in a pear orchard adjoining the one where the parasite had been liberated in 1925–26, 35 parasites emerged from 497 cocoons of the first brood of *Dasyneura* and 84 were discovered in 292 dissected larvae of the second. Very few host larvae were present in January 1934 and no eggs or larvae in February, when there were no young leaves suitable for infestation. A brief account of the development of the parasite is given. Several eggs are usually laid in the host egg, but only one parasite develops. It pupates in the soil within the empty integument of the dead host larva after the latter has made its cocoon.

DUMBLETON (L. J.). **The Woolly Aphis of Pear** (*Eriosoma lanuginosum* **Htg.**).—*N.Z.J. Sci. Tech.* **16** no. 3 pp. 167–168, 4 refs. Wellington, N.Z., November 1934.

Since it is improbable that *Eriosoma ulmi*, L., occurs in New Zealand, where there is no record of infestation of the roots of currants (*Ribes*), and since there is no evidence that *E. lanigerum*, Hsm., migrates from apple to elm there, *E. lanuginosum*, Htg., is probably responsible for the galls on the leaves of elm in that country. This was confirmed not only by the appearance of the galls but by the healthy condition and manner of development in a colony transferred from elm to the roots of pear, whereas spring migrants failed to develop on branches of pear or apple or roots of apple or black currant. Small galls (caused by the fundatrices hatching from the overwintering egg) were first observed on elm at Nelson in the beginning of November and reproduction had begun towards the end of the month. By mid-December most of the galls are fully grown, and some contain spring migrants. No actual migration has been observed in the field, although the Aphid has once been recorded from young pear trees, but migrants transferred experimentally to pear roots gave rise to wingless forms, which fed and matured on the roots. Winged Aphids appeared in the colony early in March and in the field these would fly to elm. The progeny of these autumn migrants had the reduced proboscis characteristic of the sexual forms.

DA COSTA LIMA (A.). **Sobre alguns Coccideos.** [On Some Coccids.]—*Arq. Inst. Biol. veg.* **1** no. 2 pp. 131–138, 6 figs., 15 refs. Rio de Janeiro, November 1934.

Descriptions are given of the following Coccids from Brazil:—*Lachnodiella* (?) *bondari*, sp. n., on a forest tree; *Parlatoria fluggeae* var. *brasiliensis*, n., on orange (*Citrus aurantium*); and *Odonaspis ruthae*, Kotinsky, on *Cynodon dactylon*. The scope of the genus *Lachnodiella* is discussed, and a list is given of the species of *Odonaspis*, with their food-plants and distribution.

MYERS (J. G.). **Notes on Cocoa-beetle and Cocoa-thrips.**—*Trop. Agriculture* **12** no. 1 p. 22, 1 fig. Trinidad, January 1935.

A heavy infestation of *Steirastoma depressum*, L. (cacao beetle) has been found on *Hibiscus tiliaceus* on a coastal area of Trinidad. This

is probably as important a wild food-plant as *Pachira insignis* and *Malachra alceifolia*, at least in the coastal regions. Others sometimes infested are *Sterculia caribaea*, *Couroupita guianensis* and *H. esculentus*. The Capsid predator of *Selenothrips* (*Heliothrips*) *rubricinctus*, Giard [*R.A.E.*, A **19** 627] has been identified as *Termatophylidea pilosa*, Reut., which has not been recorded since its discovery in Jamaica some 30 years ago.

FISHER (W. S.). **New Anobiid Beetle from Canada.**—*Canad. Ent.* **66** no. 12 pp. 275–276. Orillia, December 1934.

A description is given of *Platybregmus canadensis*, gen. et sp. n., collected on 21st June 1934 from maple flooring and elm beams in the basement of a house in Ontario. Pine wood in the house was not infested. The flooring had been in the house for about 30 years and was made of locally grown timber.

CARTER (W.). **The Symbionts of *Pseudococcus brevipes* in Relation to a Phytotoxis Secretion of the Insect. (Abstract.)**—*Phytopathology* **25** no. 1 p. 10. Lancaster, Pa, January 1935.

Green spotting of leaves of pineapple in Hawaii is a toxic effect of feeding by *Pseudococcus brevipes*, Ckll. [*cf. R.A.E.*, A **21** 64] and is invariably associated with the presence in the insect of a bacillus-like symbiont. When the insect colony is transferred from pineapple to *Panicum barbinode*, the mealybugs can no longer cause green spots and the symbiont disappears. This process is not complete until the second generation on the grass emerges. Meanwhile, intermediate stages in the transmission of the bacillus can be recognised. The final and apparently stable form is a minute coccus rod, always found in mealybugs that do not cause green spotting. Thus far the reappearance of the bacillus or the production of green spots has not resulted from returning the colony to pineapple. It is concluded that the particular effect of the insect's secretion in causing green spots is due to the presence of this specific symbiont in the bacillus form.

GARDNER (M. W.), TOMKINS (C. M.) & WHIPPLE (O. C.). **Spotted Wilt of Truck Crops and Ornamental Crops. (Abstract.)**—*Phytopathology* **25** no. 1 p. 17. Lancaster, Pa, January 1935.

The virus of spotted wilt of tomatos in California has been transmitted from *Emilia* to *Emilia* and tomato and from *Calla* to tomato by *Thrips tabaci*, Lind., and from *Datura* to poppy and from tomato to tobacco by *Frankliniella* sp.

OSBORN (H. T.). **Incubation of the Virus of Pea Mosaic in the Aphid, *Macrosiphum gei*. (Abstract.)**—*Phytopathology* **25** no. 1 p. 31. Lancaster, Pa, January 1935.

The virus of pea mosaic, which has already been shown to require about 12 hours incubation in *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.) before it can be transmitted [*R.A.E.*, A **22** 131], undergoes a similar period of incubation in *M. solanifolii*, Ashm. (*gei*, auct.), not less than 12 or more than 18 hours being necessary for proper incubation. A second virus affecting peas and other leguminous plants

(designated as pea-mosaic virus no. 2) is transmitted mechanically by both Aphids. This virus is transmissible by *M. onobrychis* within 30 minutes after being picked up and is not usually retained for more than an hour.

Poos (F. W.) & Elliott (C.). **Bacterial Wilt of Corn and its Insect Vectors. (Abstract.)**—*Phytopathology* **25** no. 1 p. 32. Lancaster, Pa, January 1935.

In April 1934 *Aplanobacter stewarti* was isolated in Virginia from adults of *Chaetocnema pulicaria*, Melsh., that had hibernated (*R.A.E.*, A **22** 600). Its transmission from infected to healthy maize plants by adults of *C. pulicaria*, *C. denticulata*, Ill., and *Diabrotica duodecimpunctata*, F., was confirmed (*cf.* **12** 120), and adults of *C. pulicaria* also transmitted it from maize to *Euchlaena mexicana*.

Mahdihassan (S.). *Elasmus claripennis* **Cam., a Hyper-parasite of Lac Insects.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 509–514, 5 figs., 5 refs. Columbus, Ohio, December 1934.

Since *Elasmus claripennis*, Cam., has been observed to parasitise a caterpillar that bores in sugar-cane in Mysore, studies of its biology were undertaken to determine the chances of increasing its numbers on a host other than *Eublemma amabilis*, Moore, which attacks the lac insect (*Laccifer lacca*, Kerr). They showed that 5–13 larvae of the parasite, females predominating, occur on a single larva of *Eublemma*, and despite its rarity, it might be induced to reproduce under experimental conditions. It has been reared in numbers, and no parasites of it have been noticed.

Menusan, jr. (H.). **Effects of Temperature and Humidity on the Life Processes of the Bean Weevil, *Bruchus obtectus* Say.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 515–526, 3 graphs, 10 refs. Columbus, Ohio, December 1934.

The following is taken from the author's summary: A method of evaluating the effects of temperature and humidity as environmental factors is outlined. *Bruchus obtectus*, Say, is able to develop in stored beans and reproduce within the range of 17 to about 34°C. (62·6–93·2°F.) with relative humidities of 20–98 per cent. The optimum temperature for the eggs, larvae and pupae is about 30°C. (86°F.) and for the adults 27°C. (80·6°F.), as measured by the rate of oviposition and the number of eggs laid. Variations from these temperatures increased the mortality and the length of time required for development. The lives of adults became longer as the temperature decreased from 40 to 8°C. (104 to 46·4°F.). The optimum humidity for the eggs is 50–75 per cent. measured by viability, for the larvae and pupae it is practically saturation, though the development of fungi complicates the accurate determination of this point, and for the adults it is about 90 per cent. Above 24°C. (75·2°F.) the eggs hatch more rapidly at 90 per cent. relative humidity than at 50 per cent., but below this temperature they hatch more quickly at 50. At least two curves, the exponential and the catenary, are necessary to express the effects of constant temperatures on the duration of adult life and on the rate of development of the various stages.

Griswold (G. H.). **Oviposition in the Columbine Borer,** *Papaipema purpurifascia* **(G. & R.) and the Iris Borer,** *Macronoctua onusta* **Grt.** —*Ann. ent. Soc. Amer.* **27** no. 4 pp. 545–548, 1 pl., 3 refs. Columbus, Ohio, December 1934.

Since *Papaipema purpurifascia*, Grote & Rob., and *Macronoctua onusta*, Grote, which are common pests of columbine [*Aquilegia*] and iris, respectively, both hibernate in the egg-stage, their oviposition habits were studied during the late summer and autumn of 1933 in New York State. The containers in which the pupae and adults were reared from larvae are described. On emerging, pairs of adults were placed in separate cages in the field. Pairing was not observed, but oviposition usually began on the second night. *Papaipema* laid eggs from 21st August to 21st September, the average period of oviposition for 9 females being 12·8 days; eggs were laid by *Macronoctua* from 20th September to 8th November, with an average oviposition period for 11 females of 7·5 days. The average number of eggs laid by females of each of the two species was 523·54 and 1,065·72, respectively. The females of *Papaipema*, which scattered the eggs singly on the ground or bottom of the cage, laid fairly regularly during the entire period but attained peaks in 1–2 days and again after a further 7 days. The females of *Macronoctua* generally attached their eggs, usually in clusters of 70–90, to dried leaves or any rough surface. Most of them were laid during the first 2–3 days. Unfertilised females, one of which laid 210 eggs in 15 days, had a longer pre-oviposition period than those that had paired.

Bird (H.). **Decline of the Noctuid Genus** *Papaipema* **(Lepidoptera).**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 551–556. Columbus, Ohio, December 1934.

The author discusses the pronounced reduction in abundance of Noctuids of the genus *Papaipema* in the eastern United States and southern Canada. He considers this to be due primarily to the destruction of the hibernating eggs caused by the burning of waste lands.

Schaffner, jr. (J. V.). **Introduced Parasites of the Brown-tail and Gipsy Moths reared from native Hosts.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 585–592, 5 refs. Columbus, Ohio, December 1934.

In order to obtain information on the adaptation to indigenous hosts of the 12 introduced parasites that have been established in the United States for the control of *Porthetria dispar*, L., *Nygmia phaeorrhoea*, Dön., *Stilpnotia salicis*, L., and *Monema* (*Cnidocampa*) *flavescens*, Wlk., large numbers of native larvae obtained from New England, New York, New Jersey, north-eastern Pennsylvania and occasionally other States have been reared annually since 1915 in Massachusetts. Five of the parasites have been obtained, *viz.*, *Apanteles lacteicolor*, Vier., *A. melanoscelus*, Ratz., *Meteorus versicolor*, Wesm., *Sturmia scutellata*, R.-D., and *Compsilura concinnata*, Mg.

*A. lacteicolor* [*cf. R.A.E.*, A **6** 511] has reproduced in the laboratory on *Apatela hasta*, Gn., *Schizura unicornis*, S. & A., and *Hemerocampa leucostigma*, S. & A., and has been recovered from field collections of *A. hasta*, *Datana ministra*, Drury, and *Hyphantria cunea*, Drury, from localities where *Nygmia phaeorrhoea* was abundant. This

Braconid and *Meteorus*, which was recovered only from *Notolophus* (*Orgyia*) *antiquus*, L., have not been obtained beyond the limits of the infestation by *Nygmia* in New England, and they are evidently dependent on this host. *Apanteles melanoscelus* [**10** 403] has been reared on *Malacosoma americana*, F., *M. disstria*, Hb., *Hemerocampa leucostigma*, *Olene basiflava*, Pack., *Nygmia* and *Stilpnotia* and has been recovered in the field from *Hemerocampa*. Judging by its distribution, it can apparently exist independently of *Porthetria* (of which it is an important parasite, also occasionally attacking *Stilpnotia*), but it appears that except for *Hemerocampa* native Lymantriids are seldom, if ever, attacked in the field, since the parasite has not been obtained from large numbers collected in localities where it is known to be abundant.

*Sturmia* is an important parasite of *Porthetria*. It oviposits on the foliage, has one generation a year and hibernates as a pupa in the soil. It is not dependent on other hosts but has been obtained, though rarely, from *D. integerrima*, G. & R., *Symmerista albifrons*, S. & A., *M. disstria* and unidentified Noctuids. *Compsilura* is a valuable parasite of *Porthetria*, *Nygmia* and *Stilpnotia*. Adults of the hibernating brood attack these larvae in May and June, the progeny of subsequent generations being dependent on native hosts. There are 2–4 generations annually, and the winter is passed in the larval stage within prepupae or pupae of the hosts. This Tachinid has been recorded from numerous hosts, many of which may be occasional or accidental. Species that are active or exposed during the day are most frequently parasitised, but very hairy larvae or those that are protected by webs escape. A brief discussion of its distribution [*cf.* **16** 123] shows that *Compsilura* has spread westwards and is present at least 150 miles beyond the limits of *Porthetria* infestation. Numerous cases of its effectiveness against native Lepidoptera, particularly in New England, have been recorded.

Pepper (B. B.) & Driggers (B. F.). **Non-economic Insects as intermediate Hosts of Parasites of the Oriental Fruit Moth.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 593–598, 2 refs. Columbus, Ohio, December 1934.

The majority of parasites of *Cydia* (*Grapholitha*) *molesta*, Busck, in America (apart from recent importations) appear to be native species, many of which were obtained before its introduction, probably from insects living in weeds, so that the question of alternative hosts should be considered. It appears that a study of the biology of insects infesting weeds and of their natural enemies would be of value in the campaign against *C. molesta* and probably against other insects of economic importance. It has already been found that *Epiblemma strenuana*, Wlk., breeding in ragweed (*Ambrosia artemisiaefolia*) in New Jersey serves as a host for several of the parasites of *C. molesta* [*R.A.E.*, A **19** 204], and investigations there of the parasites hibernating in insects feeding in ragweed in or near peach orchards during the winters of 1931–33 revealed fairly large numbers of *Glypta rufiscutellaris*, Cress., *Pristomerus ocellatus*, Cush., and *Cremastus minor*, Cush., but few, if any, of *Macrocentrus delicatus*, Cress., and *M. ancylivorus*, Rohw. Parasitism of 75 per cent. of the first brood larvae of *C. molesta* in one peach orchard, compared with about 20 per cent. in 3 others, including one in which liberations had been made, appeared to be related to extensive

growths of weeds round the trees; furthermore, infestation has been comparatively heavier for many years in the 3 orchards in which clean cultivation is practised. Parasitism of the overwintering larvae is usually low, as they are protected within the fruit; *Macrocentrus* spp. appear to be less abundant in these individuals than *Glypta* and some minor species, yet over 90 per cent. of the parasites reared were found to be *M. ancylivorus*. Collections of weeds were made in the orchard concerned in the autumn of 1932; almost all the species mentioned above were reared from ragweed (*Ambrosia artemisiaefolia*) and *Macrocentrus delicatus* and *M. ancylivorus* were obtained in fairly large numbers from small Lepidopterous larvae found in smartweed (*Polygonum*). A smaller number of twigs attacked by *Cydia* larvae were collected in one hour in July 1933 from weed-infested orchards than from clean ones, but the number of parasites reared from them was always greater.

Dowden (P. B.). **Recently introduced Parasites of three important Forest Insects.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 599–603, 3 refs. Columbus, Ohio, December 1934.

Several thousand cocoons of *Cremastus interruptor*, Grav., and *Orgilus obscurator*, Nees, parasites of *Rhyacionia buoliana*, Schiff. (European pine shoot moth) were received in the United States from Austria, and in spite of the activity of *Perilampus tristis*, Mayr, a secondary parasite, which represented 75 per cent. of the adults emerging in 1933, 1,200 fertilised females of *Cremastus* and 400 of *Orgilus* have been liberated during the last 3 years. Recoveries have been made of *Orgilus*, which was, however, undoubtedly introduced with the moth, from larvae of which it was obtained in Rhode Island in 1925, though it has previously been valueless for control. The Encyrtid, *Copidosoma geniculatum*, Dalm., and the Eulophid, *Tetrastichus turionum*, Htg., have been reared in large numbers from *Rhyacionia* in Austria, and numerous colonies of adults have been liberated in New York, Connecticut and Massachusetts, comprising totals of 156,000 and about 127,000, respectively, in 1934 [*cf. R.A.E.*, A **22** 356]. The Encyrtid completes its larval development when the host larva is mature and pupates inside its empty skin, about 16 parasites emerging from a single larva. The Eulophid lays about 20 eggs in either the larva or pupa, and the full-grown larvae hibernate within the pupal shell. About 5,000 puparia of *Lypha dubia*, Fall., have been received from Austria in the last 2 years. This Tachinid, which overwinters as a pupa, may be already present in America though the native species identified as *L. dubia* does not appear to attack *Rhyacionia*.

Only three of seven parasites reared in Austria from *Coleophora laricella*, Hb. (larch case-bearer) are suitable for liberation, namely, *Chrysocharis laricinellae*, Ratz., which overwinters as a mature larva in the case of the hibernating host, the adults emerging in the spring and giving rise to another generation, and *Angitia laricinella*, Strobl., and *Microdus* (*Bassus*) *pumilus*, Ratz., which hibernate in the case of the immature larvae but do not complete development until May, when the latter have matured. Totals of about 5,000, 500 and 500 individuals, respectively, were reared from material received in 1934, and *Chrysocharis* was liberated in New York, Maine and Massachusetts. Adults of the other two species emerged in early June and, since they do not live sufficiently long in confinement, liberations had to be made

when the host was in the egg-stage, though no larvae would be suitable for parasitism until the end of July. In England, *A. nana*, Grav., lived long enough in the laboratory to attack the new generation of larvae developing during July [*cf.* **21** 483] ; many individuals sent to Canada were killed by the hot weather—and no recoveries have been made.

Two parasites of *Phyllotoma nemorata*, Fall. (birch leaf-mining sawfly), *Chrysocharis* sp. and *Phanomeris phyllotomae*, Mues., were collected in northern Austria, and about 3,000 adults of the former and about 500 fertilised females of the latter were liberated against this sawfly in Maine. *Chrysocharis*, which is the more abundant, attacks the small host larvae and pupates within their mines ; it may have more than one generation a year but overwinters in the larval stage, in which it has been received. The Braconid forms a cocoon in the tunnel of the host, in which it hibernates. Both these parasites also attack *Fenusa pumila*, Klug, another sawfly that mines in birch leaves and has been introduced into New England, where it is abundant.

The methods of collecting, exporting and receiving the parasites are described.

Strom (L. G.). *Macrosiphum asterifoliae*, **new Species from Aster (Aphiidae: Homoptera).**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 619–620, 1 fig., 1 ref. Columbus, Ohio, December 1934.

The alate and apterous viviparous females and the apterous oviparous female of *Macrosiphum asterifoliae*, sp. n., are described from numerous individuals collected from the lower surface of the lowest and largest leaves of *Aster* sp. in Wisconsin during the summer and autumn of 1933. They were feeding in large colonies in well shaded areas only.

Haug (G. W.). **Effect of Argentine Ant Poison on the Ant Fauna of Mississippi.**—*Ann. ent. Soc. Amer.* **27** no. 4 pp. 621–632, 3 figs. Columbus, Ohio, December 1934.

At least 140 species of ants occur in Mississippi, of which about 20 are of economic importance. Very large quantities of an attractive and toxic bait [of 9 lb. granulated sugar, 9 U.S. pints water, 6 gm. crystallised tartaric acid, 8·4 gm. sodium benzoate, 15 gm. sodium arsenite and $1\frac{1}{4}$ lb. honey (*cf. R.A.E.*, A **8** 285)] have been distributed in Mississippi during the last few years against *Iridomyrmex humilis*, Mayr. Examination for ants' nests of 6 acres of soil surface on residential blocks in the City of Columbus indicated that the bait does not cause any economic reduction in the populations of other ants, which are found on an average block at the rate of one colony to every 125 sq. ft. of ground surface. Of the population distributed over the entire area under examination, 60 per cent. was of economic importance, 28 per cent. being represented by *Solenopsis geminata xyloni*, McCook.

*Iridomyrmex* eventually predominates once it is introduced into a particular area, other species being poorly represented. It may, however, be practically eradicated by the bait, and the other species, especially *Solenopsis*, then increase, though the bait controls their numbers to some extent. In spite of the number of species of ants, *Solenopsis*, *Pheidole vinelandica*, For., and *Prenolepis* (*Nylanderia*) sp., constituted 63–69 per cent. of the population in each plot examined, except in one, where they constituted 89 per cent.

MICHELBACHER (A. E.) & ESSIG (E. O.). **A Progress Report on the Behaviour of the Alfalfa Weevil in Middle California, 1933.**—*J. econ. Ent.* **27** no. 6 pp. 1119–1127, 1 ref. Geneva, N.Y., December 1934.

Further reports are given of population studies of the alfalfa weevil [*Hypera variabilis*, Hbst.] in California in 1933, with particular reference to three areas, information about two of which was noticed from the previous report [*R.A.E.*, A **23** 29]. The populations in 1933 were considerably greater than had been expected ; in neglected fields 100 sweeps of the net caught 6,000 larvae in the first area, 1,700 in the second and 500 in the third. The greatest number of larvae occurred on the first cutting of lucerne except in two fields in the second area, where they were most numerous on the second crop. Although the weevil population was lower in better tended fields of the first area, in the second, where climatic conditions were favourable [*loc. cit.*], the counts ranged from 1,000 to 1,700, even in well cared for fields. The weevil therefore may become injurious under conditions prevailing in the second area, although if the lucerne receives suitable care it will probably outgrow the injury.

In the third area, which covers two adjacent localities in the San Joaquin Valley, less larvae were taken on first cutting than in the other two areas. In one locality within this area, both larvae and adults could be easily collected throughout the entire growing season ; in the other, the weevils, after having been numerous early in the season, became very scarce after the fourth crop and finally almost disappeared. Both fields received two irrigations at a single cutting, and it is thought possible that the change in field temperature thus produced may have been more favourable to the weevils in the field with the higher population. Irrigation may help them in parts of the hot, dry valleys where heat would otherwise restrict their activities, though under such conditions severe damage is unlikely. In one locality where they became scarce, the low-lying land was only irrigated twice, in May and July, so that extreme dryness at the end of the summer may have contributed to the decline of the population.

The fact that in California at least 6 crops of hay may be expected, in contrast to only 3 in the Great Basin [*cf.* **17** 78], tends to check the destructiveness of *Hypera*. Nevertheless, when lucerne is cut for the first time early in April, the prevailing temperatures may be low and cultural kill considerably reduced. Higher maximum temperatures can be expected in middle California than in the Great Basin, with the exception of the second area studied, where proximity to the sea keeps the maximum temperatures much lower. High temperature coupled with extreme dryness probably constitute a satisfactory check.

Parasites of *H. variabilis* have been introduced during the past season into all the areas mentioned, but the numbers established and their influence is unknown. Birds probably prey on the weevils, particularly when the fields are being irrigated. No general flight of *H. variabilis* has been observed, but it has often been seen to fly.

Random collections of weevils showed that eggs are laid almost continuously throughout the growing season, and oviposition probably continues throughout the winter, since several batches of eggs, obviously freshly laid, were observed in field cages in January 1933 in stems of lucerne that had been injured by frost. Evidence from another field cage makes it probable that *Hypera* can also overwinter

in the pupal stage. It breeds on bur clover [*Medicago* sp.] and sweet clover [*Melilotus*], which appear with the first autumn and winter rains and constitute its alternative food-plants until early summer.

Bissell (T. L.). **Ineffectiveness of Surface Cultivation to prevent the Burrowing of Pecan Weevil Larvae into the Soil under Pecan Trees.** *J. econ. Ent.* **27** no. 6 pp. 1128–1130, 1 ref. Geneva, N.Y., December 1934.

Experiments in pecan orchards in two localities in Georgia contradicted the results of previous tests, which had indicated that the larvae of *Curculio caryae*, Horn, can be prevented from entering the soil by levelling and rolling after clearing it of vegetation [*R.A.E.*, A **19** 674]. Practically the same numbers of larvae entered the treated and untreated soils. The rains in October 1932 were heavier than in 1931 and may have helped the larvae to burrow by softening the ground and by reducing the temperature of the soil near the surface. Accumulations of leaves, which keep the surface moist, may also have allowed more larvae to enter the soil.

de Ong (E. R.). **Calcium Carbonate as a Weevil Control.**—*J. econ. Ent.* **27** no. 6 pp. 1131–1132. Geneva, N.Y., December 1934.

A combination of a specially prepared calcium carbonate and imported talc, which has long been used in California for coating rice intended for export to Japan in order to retain its flavour, was found to protect the rice from injury by insects. To determine its effectiveness small numbers of *Calandra* (*Sitophilus*) *oryzae*, L., and *Tribolium confusum*, Duv., were placed alive in jars of coated and uncoated rice on 20th November 1932 and kept in an unheated room where the temperature ranged from 50 to 75°F. A few drops of water were occasionally added to permit breeding whenever the temperature was high enough. Examination after 60 days exposure at winter temperatures, showed a decrease of 50 per cent. (11 out of 22) in the numbers of living weevils in the coated rice and 23 per cent. (4 out of 17) in the uncoated. A further examination on 31st October 1933, following high temperatures that had permitted breeding, showed 22 live weevils in the coated rice and 175 in the uncoated. The coated rice weighed 76 lb. per cu. ft. and the uncoated rice 44. Of 10 individuals of *T. confusum* placed in the uncoated rice, 5 were alive and 4 dead at the first examination, and in the coated rice 6 out of 13 were alive. At the later examination two living individuals were found in the uncoated and one in the coated rice.

Beal (J. A.). **Relation of Air and Bark Temperatures of infested *ponderosa* Pines during Subzero Weather.**—*J. econ. Ent.* **27** no. 6 pp. 1132–1139, 1 fig., 6 refs. Geneva, N.Y., December 1934.

The following is mainly taken from the author's summary: Low winter temperatures are sometimes very important in the natural control of *Dendroctonus brevicomis*, Lec. Records of previous observations on their effect in reducing overwintering broods are discussed [*R.A.E.*, A **21** 648, etc.], and data on subcortical and air temperatures obtained in the field in 1933 in Oregon during the coldest period of the winter are analysed and compared with them.

Hourly records of air and inner bark temperatures on infested standing pines (*Pinus ponderosa*) during a period of rapidly falling temperatures showed that when the air reached a temperature as low as —26°F. for a short time only, the subcortical temperatures in trees ranged from 8 to 29 degrees higher. The extent of divergence between subcortical and air temperatures largely depend on the thickness of the bark. Temperature variations according to the side of the tree are not believed to be very important. Sunlight on the snow tends to warm all sides of the trees above air temperatures.

Critical temperatures for broods of *D. brevicomis* under forest conditions in Oregon were considerably lower than those determined under laboratory conditions for examples from California [**20** 15], where there was little or no survival after exposures to —10°F., or lower. In Oregon, brief exposures to subcortical temperatures of —11°, —14°, and —17°F., resulted in survivals of 44·5, 36·0 and 27·6 per cent., respectively. Temperatures below zero usually result in some mortality, and air temperatures below —15°F. cause considerable reduction of broods, but further work is necessary to determine precisely the conditioning factor and effects of critical temperatures.

Siegler (E. H.), Munger (F.) & Gahan (J. B.). **Improvement in "Apple Plug" Technic for toxicological Studies of the Codling Moth.**—*J. econ. Ent.* **27** no. 6 pp. 1140–1142, 1 fig., 1 ref. Geneva, N.Y., December 1934.

An improvement has been devised in the recently noticed laboratory method [*R.A.E.*, A **21** 338] of testing insecticides against newly-hatched larvae of the codling moth [*Cydia pomonella*, L.]. A perforated cork, covered at one end with a piece of cloth through which a pin is pushed, serves as a holder for a small piece of waxed paper, bearing an egg. The cork is sealed to the top of a glass cylinder and when the larva has hatched it lowers itself by a silk thread to the apple plug, which fills the other end of the cylinder, or crawls up the pin to the cloth and thence down the vial to the fruit.

Lilly (J. H.) & Fluke (C. L.). **A Progress Report on the Control of the Cherry Case Bearer (*Coleophora pruniella*, Clem.) in Wisconsin.**—*J. econ. Ent.* **27** no. 6 pp. 1142–1147, 1 ref. Geneva, N.Y., December 1934.

In continuation of control experiments on *Coleophora pruniella*, Clem. (cherry case bearer) on apple in Wisconsin [*R.A.E.*, A **21** 514, 601] during 1932–33, dormant lime-sulphur (1 : 8) was effective in some cases, particularly if applied in the autumn, when it gave 98 per cent. control. Neither lead arsenate nor blood-albumen appeared to increase its efficiency. A "cold-mix" petroleum oil of low viscosity was superior to a "cold-mix" oil of medium viscosity (giving 95 as compared with 92 per cent. control at a 6 per cent. concentration) and is probably less dangerous to the trees. Even at a concentration as low as 6 per cent., however, "cold-mix" emulsions are sometimes very detrimental to fruit and leaf buds. Miscible oils were not quite so toxic as the "cold-mix" emulsions, but they are probably less apt to injure the trees. A tar oil wash at concentrations of 6 and 8 per cent. gave 91 and 96 per cent. mortality.

Under average orchard conditions, dormant lime-sulphur seems entirely harmless to fruit-trees, but fails to control *Eucosma* (*Tmetocera*) *ocellana*, Schiff., and *Tortrix* (*Archips*) *argyrospila*, Wlk. The petroleum oil emulsions may damage the trees, but usually give satisfactory control of *T. argyrospila*. The tar oil wash used does not injure the trees much, and higher concentrations of it seem to give partial control of both the Tortricids.

Bartlett (K. A.) & Lefebvre (C. L.). **Field Experiments with** *Beauveria bassiana* **(Bals.) Vuill., a Fungus attacking the European Corn Borer.**—*J. econ. Ent.* **27** no. 6 pp. 1147–1157, 6 refs. Geneva, N.Y., December 1934.

Experiments on the entomogenous fungus, *Beauveria bassiana* [*R.A.E.*, A **19** 266; **22** 457], were made in Massachusetts to see if it could be used to control *Pyrausta nubilalis*, Hb., under natural conditions. Previous investigations of entomogenous fungi in insect control are discussed from the literature. When pupae placed in a humid atmosphere were dusted with spores, the development of the fungus prevented the emergence of the adults. Egg-masses were infected under similar conditions, but they are not likely to be infected in nature as they are laid on the lower surfaces of the lower leaves. The tassels and the axils of maize leaves are good places for spore material to accumulate and are most frequently penetrated by the larvae. The technique of preparing material for inoculation in the field is explained. The fungus spores grew best on common wheat flour, and were effectively carried by it.

In 1930, when 4 fields, each one acre in extent, were used, alternate fields were dusted with spores of *Beauveria*, which were directed towards the tops of the plants, one week after oviposition had reached its maximum and again after all the eggs had hatched. This experiment was directed against first generation larvae, while another was conducted elsewhere against those of the second generation. Fewer live larvae were recovered from the dusted plots than from the control plots, but the percentage of dead larvae taken from the former was not high enough to represent this disparity. Many of the dead larvae, however, were apparently blown away and lost, and very small larvae, which had been particularly susceptible to the fungus in the laboratory, were seldom discovered when the plants were dissected, although no doubt they had died of the disease. In the second generation, 30·9 per cent. of the larvae were killed by the fungus when 20 gm. of spores were used to the acre, and 1·4 per cent. when 10 gm. of spores were used. On the two fields that were dusted the numbers of live larvae were 31·2 and 41·3 per cent. less than in the controls.

In 1931, 20 gm. spore material per acre was applied at the first signs of larval feeding, and again when nearly all the eggs had hatched. Flour, at the rate of 8 lb. to 10 gm. spores, was used as a carrier. Dissection of maize plants from all parts of the field showed that an average of 71·3 per cent. of the larvae and pupae had been killed, and the number of living larvae was 70·4 per cent. lower than in the untreated plots. According to further tests against larvae of the second generation a series of applications at short intervals is more effective than one application, even if the total quantity of spores used is less.

Attempts were also made during 1931 to establish the fungus in areas overgrown with weeds, where many infestations by *Pyrausta*

originate. The first definite evidence of success was the discovery during August 1932 in cocklebur plants [*Xanthium*] of first generation larvae killed by the fungus. As no liberations had been made there since 1931, it was assumed that the fungus had overwintered and re-infected the new larvae. Data are as yet insufficient to indicate whether the fungus will prove to be of value under field conditions.

WATTS (J. G.). **A Comparison of the Life-cycles of *Frankliniella tritici* (Fitch), *F. fusca* (Hinds) and *Thrips tabaci* Lind. (Thysanoptera-Thripidae) in South Carolina.**—*J. econ. Ent.* **27** no. 8. pp. 1158–1159. Geneva, N.Y., December 1934.

The life-histories of *Frankliniella tritici*, Fitch, *F. fusca*, Hinds, and *Thrips tabaci*, Lind., which are causing increasingly serious injury to cotton seedlings in South Carolina, were studied under identical conditions during May–October 1932. A comparative table shows the duration of the various instars. The most significant difference is in incubation period, which averages 6·71 days in *F. fusca*, 3·32 in *F. tritici* and 4·56 in *T. tabaci*. Consequently, where all three species occur together, insecticides should be used when the two last species are in the second instar and when *F. fusca* is in the first.

On an average, the life-cycle of *F. fusca* requires 18·5 days, the female lays 55·5 eggs, and the adult lives for 29·08 days ; for *F. tritici* these figures are 15·01, 41·25 and 21·42, and for *T. tabaci*, 16·3, 44·25 and 18·33. All three species may be found throughout the year in South Carolina, but they are most destructive from March to October.

GAMBRELL (F. L.). **Gladiolus Thrips Control Studies and Observations on Bulb Mite Infestation.**—*J. econ. Ent.* **27** no. 6 pp. 1159–1166, 2 figs., 3 refs. Geneva, N.Y., December 1934.

Experiments in the control of *Taeniothrips gladioli*, Mlt. & Stnw., which was first noticed as being injurious to *Gladiolus* in New York during 1931 and is now widespread [*R.A.E.*, A **21** 464, 465], dealt with treatment of the corms and the use of insecticides in the field. All corms used in the treated plots were uniformly infested before planting and planted in the last week of June. Field treatments were begun on 13th July and repeated weekly until 15th September. An examination of corms that had received treatment before planting showed that most of the materials, such as naphthalene, mercury bichloride and calcium cyanide [*cf. loc. cit.*], were effective in killing the larvae and adults. Hot, dry weather for several weeks after the corms were planted retarded sprouting and was apparently favourable to the development of *Rhizoglyphus hyacinthi*, Banks, but so reduced the numbers of thrips that they caused no noticeable injury even to untreated plants until late in the season.

A large amount of the damage was due to *R. hyacinthi*, which mainly injured the old corms ; when the basal portion is attacked, the root system is destroyed and the plant dies. Injury to the young or developing corm, though less common, often results in the death of the plant. In rare cases the mites attack the stem immediately above the corm. Injury by them was considerably less when the corms had been treated against *T. gladioli*, but further studies are required to determine the exact status of the mite.

The stored corms were placed in double paper bags and the dry materials sifted over them, after which the bags were left closed for two weeks. Only 16 per cent. of corms treated with paradichlorobenzene (10 oz. to 100 corms) sprouted, and when this material was placed in contact with corms in the furrow after they had been partly covered at the time of planting, sprouting was reduced to about 3 per cent. Two months after planting only 8 per cent. of the corms treated with flake naphthalene in the furrow, and only 28 per cent of those similarly treated with crude naphthalene, showed signs of growth. Dipping the corms in 0·1 per cent. mercury bichloride slightly retarded early growth. The injury resulting from weekly applications of crude naphthalene, flake naphthalene or paradichlorobenzene at the rate of 500 lb. per acre on soil around the plants was less severe, although there was some evidence of scorching on the foliage and plant stems at ground level. This was more noticeable on plants treated with paradichlorobenzene, particularly during hot, dry weather. Plants sprayed with a mixture of 4 lb. Paris green, 66 lb. brown sugar and 100 U.S. gals. water, which killed some of the older and lower leaves, or with nicotine-casein mixtures, were larger and showed less injury from thrips and mites than those on plots treated with other sprays or dusts, though the latter caused no injury to the plants.

Huber (L. L.) & Sleesman (J. P.). **Technique of Field Experimentation in Entomology. I. Some Principles involved in a well-planned Experiment.**—*J. econ. Ent.* **27** no. 6 pp. 1166–1170, 5 refs. Geneva, N.Y., December 1934.

On the basis of their experience in the use of biometric principles in entomological research, the authors indicate the factors that should be kept in mind in order to obtain reliable data from field experiments. Subsequent papers will deal in turn with each of these principles.

Levine (N. D.) & Richardson (C. H.). **The Synergistic Effect of the Chlorides and Bicarbonates of Potassium and Sodium upon the paralytic Action of Nicotine in the Cockroach.**—*J. econ. Ent.* **27** no. 6 pp. 1170–1175, 1 fig., 6 refs. Geneva, N.Y. December 1934.

Adults of *Periplaneta americana*, L., were used as test insects in Iowa to determine the action of certain inorganic salts upon the toxicity of nicotine to insects. Injections, each into 10 cockroaches, were made by a method which is described, of various concentrations of nicotine solutions in 0·1 M. potassium chloride, 0·1 M. sodium chloride, 0·1 M. potassium bicarbonate, 0·1 M. sodium bicarbonate, and distilled water (as a control). The concentrations of nicotine ranged from 0·01 per cent. (gm. per 100 cc.) down to one from which no effect was observed. For distilled water and sodium chloride this concentration of nicotine was 0·001 per cent. ; for sodium bicarbonate, 0·0005 ; for potassium bicarbonate, 0·0004, and for potassium chloride 0·0001. When solutions of the salts alone were injected, only potassium bicarbonate produced a slight effect in 3 of the insects. In every case 0·05 cc. of the solution was injected through the conjunctiva at the distal end of the coxa of the hind leg. Paralysis of the legs followed in 10–45 seconds, and recovery began after an interval varying from 15 seconds to 8 minutes. Paralysis from the solutions containing the lower concentrations of nicotine was usually incomplete. A table and a graph

present comparisons of the durations of paralysis with different solutions.

Nicotine alone produced no effect in a concentration of less than 0·002 per cent. Paralysis did not occur or was incomplete at concentrations below 0·01 per cent. ; at this concentration complete paralysis lasted about $\frac{1}{4}$ minute. With nicotine in sodium chloride solution the only significant difference was a slight and variable increase in the duration of the paralysis. In sodium bicarbonate solution, nicotine usually produced paralysis of the hind pair of legs at a concentration of 0·001 per cent., but no effect was noticed when it was diluted to 0·0005 per cent. At the higher concentrations the salt distinctly increased the toxicity of the nicotine.

Nicotine in potassium bicarbonate solution had a slight effect at a concentration of 0·0005 per cent., whereas at 0·0004 per cent. an effect equivalent only to that of the salt solution alone was observed. At concentrations of 0·001–0·004 per cent., the toxicity of the nicotine was increased more than by any other salt used in the experiments.

Nicotine had a distinctly greater paralytic effect in potassium chloride solution at lower concentrations of the alkaloid than in solutions of any of the other salts ; a concentration of 0·0002 per cent. produced some effect. On the other hand no statistical difference in effect from that of potassium bicarbonate solution was found at 0·0005 per cent. nicotine concentration, and at all higher concentrations of nicotine, with the exception of 0·01 per cent., potassium chloride caused a significantly smaller increase in toxicity. When 0·01 per cent. nicotine was used, no significant difference between the effects of the salts could be detected, although the mean durations of paralysis were always significantly greater than when the nicotine was used at the same strength in distilled water.

Ginsburg (J. M.). **Control of Mealy Bugs and other resistant Insects on hardy Plants with a completely refined Petroleum Distillate.**— *J. econ. Ent.* **27** no. 6 pp. 1186–1188, 4 refs. Geneva, N.Y., December 1934.

Although low boiling petroleum distillates have been found to kill trees as well as the Coccids against which they are applied, the injury has been reduced and in some cases eliminated by freeing them from unsaturated hydrocarbons [*R.A.E.*, A **19** 581]. In New Jersey during December 1932 a practically odourless proprietary oil (A.P.I. gravity 49–60, flash point (open cup) 170°F., boiling range 370–490°F., unsulphonatable residue 98 per cent. or more, viscosity 30 Saybolt at 100°F.) was tested as an atomised spray on a variety of infested greenhouse plants. Most of the plants that failed to show injury from one application were sprayed again 8 days later. Of 34 different plants, 22 showed no injury, 7 were slightly and 5 severely injured. The mortality among the thrips, Coccids, Aphids, mites and Aleurodids on the plants varied from 90 to 100 per cent. When infested chrysanthemum plants were dipped in the pure distillate, it killed the eggs as well as the nymphs and adults of mealybugs. In July and August 1933, when 700 potted chrysanthemums infested with mealybugs were dipped in the oil before planting, the plants were not injured and almost all the insects were killed. The plants were inverted and dipped rapidly in the oil to about 1 inch from the base of the stem, and the oil was shaken off to prevent it from coming in contact with

the soil and roots. All the Aphids and mealybugs on a bed of 500 young chrysanthemum plants sprayed with the oil 3 weeks after transplantation died within 24 hours, but the leaves of many plants had begun to turn yellow. The source of this injury was traced to the roots, which had absorbed the excess of oil running off the foliage into the soil. The plants, however, eventually recovered and grew well. The results suggested that the oil should not be used on cloudy days or when relative humidity is high.

From these experiments it seems that low boiling petroleum hydrocarbons can be applied on certain greenhouse plants against insects that cannot be controlled by ordinary insecticides. The wetting and spreading properties of these distillates are greatly superior to those of water-spray mixtures. The spray should be delivered in the form of a fine fog, and both dipping and spraying should be done on sunny days when humidity is low. Permanent injury may be caused by spraying buds or flowers.

Smith (R. H.), Meyer (H. U.) & Persing (C. O.). **Nicotine Vapor in Codling Moth Control.**—*J. econ. Ent.* **27** no. 6 pp. 1192–1195, 2 figs. Geneva, N.Y., December 1934.

In California during 1928 adults of the codling moth [*Cydia pomonella*, L.] were destroyed by atomised solutions of nicotine or pyrethrins in oil, but the difficulty of getting an even distribution and the high dosage required to cause complete mortality make this method impracticable. More than 30 cc. liquid HCN to 1,000 cu. ft. with an exposure of 10 minutes were required to kill the moths in experimental fumigation under light tents during 1933. A test made with nicotine sulphate vaporised by heat led to the discovery that 1 cc. Black-leaf 50 was more effective than 30 cc. liquid HCN. Moths exposed for 2–3 seconds to a blast of concentrated vapour becamed paralysed and died. Screen cages containing moths were placed in front of an electric fan before which 1 cc. of Black-leaf 50 was vapourised in a container ; at a distance of 6 ft. they were killed, at 12 ft. they were paralysed but recovered after several hours, and at 18 ft. they were only slightly paralysed. All the moths hung in cages on an apple tree 22 ft. high and 24 ft. in spread were killed when 6 cc. Black-leaf 50 was vaporised under a tent.

A new apparatus for using nicotine in the form of vapour has been built. A chamber connected by a pressure regulator with a compressed air tank contains the nicotine or nicotine sulphate. Tubes atomise it and discharge it into two copper pipes each 2 inches in diameter and 30 inches long. The pipes are enclosed in a shield and are heated to approximately 350°C. by a gas burner below them. The gas is contained in a pressure tank. The pipes pass into the intake of the blower of a standard power duster. In passing through the pipes, the finely atomised nicotine changes to dense fumes, which are forced through the blower to the vegetation. Baffles placed in the pipes assist vaporisation. Nicotine applied thus is probably more effective than as a spray or dust.

In a newly designed portable fumatorium, a single mast bears a transverse boom that extends over two rows of trees and can be adjusted to trees not more than 26 ft. high and 26 ft. in spread. The boom supports a large canvas cover and two curtains by which the trees can be quickly and completely enclosed, and the whole apparatus

is mounted on a motor truck. All moths in trees 24 ft. high and 24 ft. in spread can be killed with a dosage of 10 cc. nicotine to a tree, and one tree can be fumigated per minute. The total cost, £15 for 20 treatments of an acre carrying 60 trees, is below the total costs incurred by spraying. It is believed that nicotine vapour will also control other pests. The moths could perhaps be killed at night or whenever the atmosphere is calm, without using the fumatorium, with a possible dosage of 30 cc. nicotine to a tree.

Crosby (C. R.). **The Box Elder Bug in New York.**—*J. econ. Ent.* **27** no. 6 p. 1196. Geneva, N.Y., December 1934.

*Leptocoris trivittatus*, Say, has been recorded for the first time from New York, where it occurred in October and November 1934 in three different localities on ornamental box elder [*Acer negundo*].

Holloway (J. K.). **The Sex Ratio of** *Macrocentrus ancylivorus* **Roh.** —*J. econ. Ent.* **27** no. 6 p. 1196. Geneva, N.Y., December 1934.

Data are given concerning the sex ratio of *Macrocentrus ancylivorus*, Rohw., based on observations of the parasites reared from 500,000 larvae of *Ancylis comptana*, Froel., collected in New Jersey between 1931 and 1934. As all the material was collected only a few days prior to parasite emergence, the sex ratio observed should be very near the normal. The average for the four years was approximately 6 females to 4 males, and the greatest annual variation from the average was 1·55 per cent.

Knowlton (G. F.), Stanford (J. S.) & Smith (C. F.). **Birds as Predators of the Beet Leafhopper.**—*J. econ. Ent.* **27** no. 6 pp. 1196–1197. Geneva, N.Y., December 1934.

*Eutettix tenella*, Baker, was found in the gizzards of 12 out of 24 species of birds among 150 specimens collected during September 1934 feeding among Russian thistle [*Salsola*] and *Bassia hyssopifolia* in desert breeding grounds of the beet leafhopper in northern Utah. It appears from the list of these species that migrating as well as native insectivorous birds will feed readily upon this leafhopper when it is abundant, as it usually is in the breeding grounds of northern Utah in early autumn.

Flanders (S. E.). *Sitotroga* **Production.**—*J. econ. Ent.* **27** no. 6 p. 1197. Geneva, N.Y., December 1934.

Adults of *Sitotroga cerealella*, Ol., reared from 1,400 lb. maize, are estimated to have produced over 50 million eggs in 18 months, using the tilted bin type of unit [*R.A.E.*, A **21** 343, etc.]. Collections began in March 1933, and the maximum daily production was noticed during July and August of the same year. Where a small but continuous supply of eggs of *S. cerealella* is required, maize is recommended for the rearing medium in preference to wheat because the equipment requires less manipulation, but wheat is generally used in producing eggs on a large scale for seasonal work [with *Trichogramma*] since the total production per unit weight of grain is reached much more rapidly with wheat than with maize. Although under normal conditions a

kernel of grain contains only one larva at a time, the number of moths' eggs on the grain is probably much higher than the number of kernels and the rapidity with which a given weight of grain is utilised apparently varies inversely with the size of the kernels. Apart from necessitating frequent replacement and consequent increased handling, the use of wheat affords greater opportunity for the establishment of *Pediculoides* [*ventricosus*, Newp.].

COCKERELL (T. D. A.). **Dolichopodidae in a Greenhouse.**—*J. econ. Ent.* **27** no. 6 p. 1198. Geneva, N.Y., December 1934.

Large numbers of *Dolichopus ramifer*, Lw., which is widely distributed in the United States, were found in November 1934 in a greenhouse in Colorado. As the flies did not appear to be in any way injurious, the possibility that they destroy small insects such as thrips may be worth investigation.

COTTIER (W.). **The Control of the Grass-grub** (*Odontria zealandica*) **in small Areas.**—*N. Z. J. Agric.* **49** no. 6 pp. 321–330, 2 figs. Wellington [N.Z.], 20th December 1934.

Notes are given on the habits of *Odontria zealandica*, White, in New Zealand [*cf. R.A.E.*, A **8** 503; **10** 90] and on the use of soil insecticides against the larvae [**20** 557; **22** 724]; and detailed recommendations are made for the management of lawns, parks, nurseries, gardens, etc., to prevent damage by them. The adults defoliate stone fruits and willows and also feed on early cruciferous crops. Where these crops cannot be avoided, lead arsenate may be frequently applied at the rate of 2–3 lb. per 100 gals. water or at the rate of 1 lb. combined with 3 lb. hydrated lime and 100 gals. water in the case of stone fruits.

FLANDERS (S. E.). **Insects on Rutaceous Trees native to subtropical Australia.**—*Pan-Pacif. Ent.* **10** no. 4 pp. 145–150, 7 refs. San Francisco, Calif., October 1934.

Examination during 1931 of the rutaceous trees of the genera *Geijera*, *Eremocitrus* and *Microcitrus*, in an area situated between 23 and 33° S. Lat. and within 500 miles east of the coast of New South Wales and Queensland, failed to reveal a native food-plant of *Coccus pseudomagnoliarum*, Kuw., a pest of *Citrus*, but showed the presence of a number of insects, of which the following have been identified: *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), *C. hesperidum*, L., and *Pseudococcus aonidum*, L. (*longispinus*, Targ.) on *Microcitrus*; *Aeolothrips* (*Coleothrips*) *geijerae*, Moulton, and *Hoplothrips* (*Dolerothrips*) *geijerae*, Moulton, on *Geijera*; and the Cerambycid, *Citriphaga mixta*, Lea, the Geometrid, *Anomogenes morphnopa*, Turner, the Pentatomid, *Biprorulus bibax*, Bred., and the Coccids, *Cerococcus stellatus*, Mask., *Lecaniodiaspis atherospermae*, Mask., *Asterolecanium transversum*, Mask., *Monophlebulus crawfordi*, Ckll., *Ceroplastes rubens*, Mask., *Coccus hesperidum*, *C. elongatus*, Sign., *C. bicruciatus*, Green, *S. nigra*, Nietn., *S. coffeae* and *S. oleae*, Bern., all on *Eremocitrus*. The Noctuid, *Catoblemma dubia*, Butl., was observed feeding on *S. oleae*.

WARDLAW (C. W.). **Diseases of the Banana and of the Manila Hemp Plant.**—Demy 8vo, xii + 615 pp., 2 col. pls., 294 figs., 559 refs. London, Macmillan & Co., Ltd., 1935. Price 30*s*.

The third section of this comprehensive work consists of chapters on virus diseases, which include a full account of the symptoms, etiology and control of bunchy-top of banana, a less detailed discussion of this disease as occurring in manila hemp (*Musa textilis*) in the Philippines, and brief notes on an infectious chlorosis or mosaic of banana recently observed in New South Wales. There is evidence that this disease, like both forms of bunchy-top, is transmitted by the Aphid, *Pentalonia nigronervosa*, Coq.

PESCOTT (R. T. M.) & WARD (K. M.). **The Grasshopper Pest. Control Methods.**—*J. Dep. Agric. Vict.* **32** pt. 12 pp. 607–612, 11 figs. Melbourne, December 1934.

Grasshoppers caused severe injury to crops and particularly to pastures throughout the Northern Mallee in Victoria in 1934, and it is possible that further damage will be caused by the hoppers of the second brood, which appear in January. Very successful results have been obtained with a poison bait of bran, molasses, sodium arsenite and water [*cf. R.A.E.*, A **23** 116], applied at the rate of 60 lb. per acre against the hoppers.

FRENCH (C.). **The Apple Root Borer.**—*J. Dep. Agric. Vict.* **32** pt. 12 pp. 632–633, 1 fig. Melbourne, December 1934.

*Leptops squalidus*, Boh., was originally a pest principally of wattles [*Acacia*], but on their removal, it attacked apples, pears and vines and has caused serious injury in some districts of Victoria for several years. The females lay about 40 eggs on one side of a leaf, both edges of which are then drawn together as a protection. On hatching, the larvae, which may live for several years, immediately attack the roots below ground [*cf. R.A.E.*, A **18** 195], sometimes killing them. The adult weevils emerge early in September and crawl up the trunks of the trees, on which they remain until late December. They feed on the foliage and may be killed by a spray of lead arsenate applied early in September. A special application is generally unnecessary where the usual spray programme for the codling moth [*Cydia pomonella*, L.] is carried out. The best control is probably obtained by nailing to the main stem a few feet from the ground a strip of smooth zinc about 3 ins. wide, over which the weevils are unable to crawl. It is usual to give the band a coating of blacklead every 3 weeks to keep the surface smooth. Large numbers of the adults may be shaken off the tree and then destroyed.

BISHOP (H. J.). **Poison Bait for Cucurbit-flies.**—*Fmg in S. Afr.* 1934 reprint no. 71, 1 p. Pretoria, September 1934. [Recd. January 1935.]

In South Africa, *Dacus ciliatus*, Lw., *D. vertebratus*, Bez., and *D. pectoralis*, Wlk., attack cucurbits from the time the fruits form until the rind becomes too hard for oviposition. The eggs are laid just below the skin and hatch in 3–5 days. The larvae pupate in the soil, and the pupal stage lasts less than a fortnight in summer. During

the summer of 1933–34, a bait-spray of 1 oz. sodium fluosilicate, 2 lb. white sugar and 4 gals. water proved much more effective in eastern Cape Province and killed the flies 3–5 days sooner than the customary one of lead arsenate, sugar and water. Field tests showed that only a few drops need be squirted at random over the foliage at intervals of 7 days and after rain while the fruit is developing.

Trappmann (W.). **Schädlingsbekämpfung.** [Pest Control.]—*Enzykl. tech. Chem.* 2te Aufl. **9** pp. 119–149, 5 figs. Berlin, 1932. Not for sale separately. [Recd. March 1935.]

The greater part of this article, which reviews the various methods of preventing and combating attack by fungous and animal (chiefly insect) pests, is concerned with chemical measures, and the most extensive section consists of a list of proprietary preparations, almost exclusively German, for each of which the manufacturer is given and the chemical composition and method of application indicated.

Paoli (G.). **Intorno ad una recente pubblicazione sulle cause nemiche delle piantagioni di Cotone in Somalia.** [Concerning a recent Publication on the Enemies of Cotton Plantations in Italian Somaliland.]—*Agricoltura colon.* **29** no. 1 pp. 15–22, 13 refs. Florence, January 1935.

This is a critical discussion of various points in Russo's survey [*R.A.E.*, A **23** 102] of the insects occurring on cotton in Italian Somaliland.

Saz (E.). **El gavilán de las abejas** *Philanthus triangulum* **F.** [*P. triangulum*, a Predator of Bees.]—*Bol. Soc. ent. Esp.* **16** (1933) no. 7–9 pp. 79–95. Saragossa, 1935.

This article describes various observations in Spain on the Sphegid, *Philanthus triangulum*, F. [*cf. R.A.E.*, A **20** 598; **22** 341], including the manner in which it captures honey-bees. Where its nests are numerous, they should be uncovered so as to expose and kill the larvae.

Pieri (A.) & Ott (A.). **Lotta biologica contro la tignola del pesco** (*Grapholitha* **o** *Laspeyresia molesta*). [Biological Control of the Oriental Peach Moth, *Cydia molesta*.]—*Note Fruttic.* **13** nos. 1–2, pp. 3–8, 21–33, 11 figs. Pistoia, January–February 1935.

*Cydia* (*Grapholitha*) *molesta*, Busck, has become a serious pest of peaches and other fruits near Pistoia since 1926. In view of the introduction of its parasite, *Macrocentrus ancylivorus*, Rohw., into Bologna in 1933 [*R.A.E.*, A **22** 173], a translation is given of part of a bulletin [**22** 178] on the method of breeding and using this Braconid.

Grandi (G.). **La tignola orientale del pesco** (*Laspeyresia* **o** *Cydia molesta* **Busck**). [The Oriental Peach Moth, *Cydia molesta*.]—*Circ. Inst. Ent. Bologna* no. 1, 8 pp., 2 pls. Bologna, 25th January 1935.

Near Bologna *Cydia molesta*, Busck, has 5 generations from May to September and infests peaches and other fruits. The Braconid

parasite, *Macrocentrus ancylivorus*, Rohw., was imported in 1933 [*R.A.E.*, A **22** 173] and *M. delicatus*, Cress., in 1934. Though these parasites have spread, it is not known whether they survive the winter and for this reason it is advisable to collect infested shoots, fruits, etc., and to apply trap-bands of corrugated paper or rags.

COSTANTINO (G.). **Studio sulle tavole dosimetriche per le fumigazioni cianidriche.** [A Study on Dosage Tables for Fumigation with Hydrocyanic Acid Gas.]—*Ann. Staz. sper. Frutt.* N.S. **1** pp. 161–198, 3 tables. Acireale, 1934.

As the concentrations of hydrocyanic acid gas used by the official organisation for tent fumigation of *Citrus* in Sicily have not always proved effective, the author has made extensive tests with the various dosage tables hitherto used. Among the results recorded here are three tables for summer fumigation; in all three sodium cyanide is used at the rate of 2 oz. to 4 fl. oz. water and 3 fl. oz. sulphuric acid (66°Bé.), and the dosages recommended were found fully effective. The first, in which the smallest quantity of sodium cyanide is required, is for *Pseudococcus citri*, Risso, the second for *Lepidosaphes beckii*, Newm. (*citricola*, Pack.) and *Aspidiotus hederae*, Vall., and the third, in which the greatest quantity of sodium cyanide is used, for *Parlatoria zizyphus*, Lucas, *Chrysomphalus dictyospermi*, Morg., *Icerya purchasi*, Mask., *Saissetia oleae*, Bern., and *Coccus hesperidum*, L.

The amounts of sodium cyanide required for *Ceroplastes sinensis*, Del G., were not ascertained, but the author found that the ovigerous females of *C. rusci*, L., were very resistant to hydrocyanic acid gas.

COSTANTINO (G.). **Norme e dati economici per la confezione di tende da fumigazione.** [Standards and Costs for the Manufacture of Tents for Fumigation.]—*Boll. Staz. sper. Frutt.* N.S. no. 3, 19 pp., 1 fig. Acireale, January 1935.

In Calabria and Sicily tent fumigation with hydrocyanic acid gas is commonly used against Coccids on *Citrus*. For growers who desire to do this work themselves, the author discusses in detail the standards of quality of material for the tents and the costs of making them.

For use with dosage tables such as those recently published [see preceding abstract], the fabric recommended is unbleached cotton, with 55–60 threads per inch both ways and weighing about 8 oz. per sq. yd. Directions are given for cutting and sewing together the strips and for marking the finished tents, so that the distance over the tree can be read off. Tables give particulars of several suitable fabrics of Italian manufacture and show the costs of making the tents.

ROCCI (U.). **Contributo alla lotta contro la *Tortrix pronubana*, Hb.** [A Contribution to the Control of *T. pronubana*.]—*Boll. Staz. Pat. veg.* N.S. **14** no. 4 pp. 416–446, 1 fig., 12 refs. Rome, 1934. (With a Summary in English.)

In fumigation experiments at Rome against *Tortrix pronubana*, Hb., cut carnations weighing about 35 oz. were placed in a copper cylinder of 20 litres capacity (about 1,220 cu. ins.) from which the air was then extracted by an electric air pump. The carnations were packed as for export, 10 larvae of *T. pronubana* were placed in each package,

and another 10 were confined singly in glass tubes closed with a wad of cotton wool and placed among the flowers. Hydrocyanic acid gas was introduced into the vacuum chamber from a flask in which it was generated. After an interval, the gas was extracted and the chamber aired.

From the results, which are tabulated, it is concluded that, allowing for the greater resistance of the pupae, a vacuum of 170 mm. mercury is sufficient to ensure complete destruction in 2 hours when sodium cyanide is used at the rate of 20–25 gm. per cu. m. [2–2·5 oz. per 100 cu. ft.]. Carnations so treated retained their normal appearance even 10–15 days after fumigation. The flowers must not be wet, as water absorbs the gas. Whether loose or packed, they were freed from almost all trace of gas by airing for 6–8 hours. Vacuum extraction was more rapid. The residual trace of the gas in the flowers was not given out, but was apparently held in the tissues so that there is no danger of the gas being liberated by flowers left in closed rooms. There did not appear to be any reason why this method should not be applied on a large scale to treatment of flowers for export.

GIGANTE (R.). **Il mosaico della zucca.** [Pumpkin Mosaic.]—*Boll. Staz. Pat. veg.* N.S. **14** no. 4 pp. 503–530, 11 figs., 1 pl., 4 pp. refs. Rome, 1934.

A detailed description is given of a mosaic of pumpkin in the neighbourhood of Rome. It was experimentally transmitted from diseased to healthy plants by juice inoculation and by the feeding of *Aphis gossypii*, Glov. This Aphid is considered to be the vector in nature, and measures against it and the use of resistant varieties are recommended.

MORGENTHALER (O.). **Krankheitserregende und harmlose Arten der Bienenmilbe *Acarapis*, zugleich ein Beitrag zum Species-Problem.** [Disease-causing and harmless Species of the Bee Mite *Acarapis*, a Contribution to the Problem of Species.]—*Rev. suisse Zool.* **41** no. 29 pp. 429–446, 6 figs., 8 refs. Geneva, June 1934.

On the basis of the length of the fourth pair of legs and of the distance between the stigmata, the author distinguishes three species of *Acarapis* parasitising honey-bees. *A. woodi*, Rennie, is the short-legged form in the tracheae that causes Isle of Wight disease; *A. externus*, Morgenthaler [*cf. R.A.E.*, A **23** 66, etc.] is the harmless long-legged form found ventrally in the neck groove; and *A. dorsalis*, sp. n., is the harmless short-legged form found dorsally in the groove between the mesoscutum and the mesoscutellum. All three have been found in Switzerland.

JARY (S. G.) & AUSTIN (M. D.). **Department of Entomology** [Report for 1933–34].—*J. S.-E. agric. Coll.* no. 35 pp. 9–16. Wye, Kent, January 1935.

Brief notes are given on a large number of pests, chiefly of vegetables and fruit trees, observed in south-eastern England during 1933–34. A mite, *Cosmoglyphus* (*Caloglyphus*) *krameri*, Berl., caused severe and widespread injury to mushrooms; one crop was almost entirely

destroyed by *Hypogastrura armata*, Nic., and holes were eaten in the caps by the rare millepede, *Choneiulus palmatus*, Němec, in one locality. Orchard pests caused local damage; *Plesiocoris rugicollis*, Fall., was well controlled on apples by delayed dormant sprays of petroleum oil against the eggs, though severe injury resulted when the treatments were not thoroughly applied. Except for *Agriotes* spp., which attacked wheat, oats and barley, pests of cereals were relatively unimportant. Cockchafer larvae, particularly *Anomala* (*Phyllopertha*) *horticola*, L., caused widespread injury, which was accentuated by the prolonged drought, to grassland, especially in Surrey. Flea-beetles, chiefly *Phyllotreta atra*, F., severely damaged crucifers; they infested seedlings in addition to well-grown plants and often destroyed successive field sowings. The attack did not decrease until early August. *Leptinotarsa decemlineata*, Say, did not reappear [*cf. R.A.E.*, A **22** 115]. *Tetranychus telarius*, L., was very abundant on hops early in the summer, but control measures together with rainy weather checked the infestation before much damage was done. No material advantage was apparent in the summer from the application of naphthalene to the soil in the previous winter [*cf.* **22** 580]. In tests with a number of sprays in July and August, when infestations were becoming widespread, lime-sulphur gave the best control but appeared to cause slight injury to the leaves of one variety when used towards the end of July. In small scale trials in August, no injury resulted from the use of 5 concentrations varying from 1 : 60 to 1 : 150. Young cones treated with a spray of 1 : 150 were harmed.

Liese (A.). **Ist eine Herabsetzung der Lüftungszeit nach Durchgasungen mit T-Gas (Aethylenoxyd) möglich?** [Is a Reduction possible in the Time required for Ventilation after Fumigation with T-Gas?]—*Z. GesundhTech. Städtehyg.* **27** no. 1 pp. 7–16, 7 refs. Berlin, January 1935.

German regulations require ordinary rooms to be ventilated for at least 20 hours and trade premises for at least 12 hours after fumigation with T-gas (10 parts ethylene oxide and 1 part carbon dioxide). Experience suggested that these periods could be shortened, and as a result of experiments here described, a ventilation period of 6 hours is stated to be sufficient for all rooms, provided that the fumigation period is 24 hours and a very exact determination of the gas residue is made before releasing the premises for use.

**Amtliche Pflanzenschutzbestimmungen.** [Official Regulations on Plant Protection.]—*Beil. NachrBl. dtsch. PflSchDienst* **7** no. 2 pp. 15–26. Berlin, 1st February 1935.

This part includes (pp. 15–16) an order of 10th October 1934 modifying the regulations governing the use of ethylene oxide as an insecticide. Rooms must be thoroughly ventilated after fumigation for at least 6 hours. All doors, windows and other apertures must then be closed for 1 hour and the temperature raised, if possible, to 15°C. [59°F.]. A sample of the gas residue must then be taken and if not more than 0·5 mg. ethylene oxide per litre is found in the free air and between cushions, etc., the premises can be used.

DÖRRE (A.). **Zehn Jahre Gesellschaft für Vorratsschutz.** [The Society for the Protection of Stored Products during the last ten Years.] —*Mitt. Ges. Vorratsschutz* **11** no. 1 pp. 2–6, 2 figs. Berlin, January 1935.

The German society for the protection of stored products was established in February 1925. This article enumerates the investigations on the biology and control of pests of stored products carried out by it or with its assistance, the lectures given on these subjects and the films and exhibits shown.

ZACHER (F.). **Oele, Fette und Seifen im Vorratsschutz.** [Oils, Fats and Soaps in the Protection of Stored Products.]—*Mitt. Ges. Vorratsschutz* **11** no. 1 pp. 6–9, 9 refs. Berlin, January 1935.

In 1932 and subsequently, the author tested the insecticidal action of 13 different vegetable oils. A batch of 200 grain weevils [*Calandra granaria*, L.] was dipped in each oil and then placed on absorbent paper. Other batches were dipped in acetone and in water. All the oils caused 100 per cent., acetone 50 per cent., and water no mortality.

The action of oils diluted with 2 or 3 parts acetone was the same as with undiluted oils. With 5 parts acetone total mortality resulted in 2 days with rape oil and in 7–11 days with the other oils. With 5 parts carbon tetrachloride to 1 part oil, most of the oils caused complete mortality in 24 hours.

Several experiments were made with *Carausius morosus*, F., to which oil could readily be applied locally on account of its long body. Oiling the stigmata failed to kill the insects, but oiling the upper side of the mesothorax crippled them instantly and killed them in 8 days. The author concludes that certain constituents of oil penetrated the skin and caused specific poisoning and points out that fatty acids have been regarded as responsible for the value of soaps as contact insecticides [*R.A.E.*, A **13** 183]. Soaps from oils and fats are salts of fatty acids and have well-known insecticidal power, but the author believes that oils and fats are more effective as emulsions than when saponified. In tests against *C. granaria* a 10 per cent. solution of soft soap was almost ineffective, and a 25 per cent. solution took five days to kill all the test insects.

ANDERSEN (K. T.). **Versuche zur Fortpflanzungsbiologie des Kornkäfers** (*Calandra granaria* **L.**). [Experiments on the Biology of Reproduction of the Grain Weevil.]—*Mitt. Ges. Vorratsschutz* **11** no. 1 pp. 10–13, 7 refs. Berlin, January 1935.

The information given here on the preference of adults of *Calandra granaria*, L., for various cereals for feeding and oviposition is substantially the same as that contained in a paper already noticed [*R.A.E.*, A **22** 719].

KUNIKE (—). **Das Auftreten des Kornkäfers in Deutschland im Frühjahr 1934.** [The Occurrence of *Calandra granaria* in Germany in the Spring of 1934.]—*NachrBl. dtsch. PflSchDienst* **15** no. 2 p. 20. Berlin, February 1935.

Data based on answers to a questionnaire and examination of samples of cereals are given on the occurrence in the spring of 1934

of the grain weevil [*Calandra granaria*, L.] in various parts of Germany. Of the 607 samples received (including some of mixed grains and wastes) 179 were infested. Of the individual cereals, the numbers of samples and (in brackets) the numbers infested were : wheat 313 (75), rye 190 (59), barley 50 (15), oats 21 (11).

Ogijewicz (B.). **Contribution à la connaissance des insectes nuisibles des granges.** [*In Polish.*]—*Trav. Soc. Sci. Lett. Wilno*, Cl. math. nat. **8** (1933) pp. 143–146, 3 refs. Wilno, 1934. (With a Summary in French.)

The insect pests observed in 43 mills and granaries in two localities in Poland during June–September 1932 were *Calandria granaria*, L., *Tinea granella*, L., *Tenebrio molitor*, L., *Trachea* (*Hadena*) *basilinea*, F., *Pyralis farinalis*, L., *Ephestia kühniella*, Zell., *Tenebroides mauritanicus*, L., *Laemophloeus ferrugineus*, Steph., *Ptinus fur*, L., *Palorus* (*Caenocorse*) *depressus*, F., and *Tyroglyphus farinae*, DeG.

Tattersfield (F.). **The Loss of Toxicity of Pyrethrum Dusts on Exposure to Air and Light.**—*J. agric. Sci.* **22** pt. 2 pp. 396–417, 8 refs. Cambridge, April 1932. [Recd. February 1935.]

Tattersfield (F.) & Martin (J. T.). **The Loss of Activity of Pyrethrum. II.**—*Op. cit.* **24** pt. 4 pp. 598–626, 5 figs., 10 refs. Cambridge, October 1934.

In the first paper a preliminary study is made of the loss of activity in pyrethrum powders (ground flowers) and dusts (extracts of pyrethrum flowers taken up by absorbent earths, such as talc or kieselguhr) under a variety of conditions with a view to determining its cause. As it was suspected that oxidation played some part, the effect of incorporating certain anti-oxidants with the dusts was also investigated.

The following is largely taken from the author's summary : Pyrethrum powders and dusts lose their insecticidal activity on exposure to light and air, the dusts more quickly than the powders. A combination of the two factors is important in the process of inactivation, for samples of pyrethrum with kieselguhr and pyrethrum with talc stored in closed vessels in the dark or exposed to air in the dark are relatively stable, and samples exposed to light in an atmosphere of carbon dioxide, nitrogen, or in a vacuum lose little of their toxicity. Those exposed in oxygen, however, rapidly lose their activity, although the rates in wet and dry oxygen are different and there is some suggestion that the type of reaction may be different in the two cases. The incorporation of anti-oxidants such as the dihydroxy-benzenes, pyrocatechol, resorcinol and hydroquinone, the trihydroxy-benzene, pyrogallol, and tannic acid, which contains polyhydroxy-benzene nuclei, retards the loss of activity caused by exposure to light and air. Phenol, which has little anti-oxidising power, and the trihydroxy-benzene, phloroglucinol, were not effective. Possible explanations of the unexpected result obtained with the latter are discussed. The protection afforded by the anti-oxidants was greater in the case of artificially prepared dusts than with ground pyrethrum flowers. There is no conclusive evidence that anti-oxidants naturally occurring in pyrethrum play any great part in stabilising the pyrethrins. The greater part of the protection would appear to be due to particle size or cellular inclusion.

In the second paper, the data presented in the first are amplified and certain corrections are made. An attempt is also made to ascertain the rate of loss of activity by exposure of dusts under more uniform conditions, and to ascertain how far the acid method of estimating the pyrethrins [*cf. R.A.E.*, A **17** 407] will determine quantitatively the loss of activity under different conditions of exposure, and what degree of correlation exists between the chemical and the biological methods of evaluation used by the authors.

The following is largely taken from the authors' summary: The degree of concordance between the content of pyrethrin I as determined by the acid method, and the insecticidal value of pyrethrinised dusts, before and after exposure to air and artificial illumination, was statistically examined. The pyrethrin I values, corrected for a small residual amount of extraneous matter, indicate fairly closely the degree of activity of the samples. The loss of pyrethrins on exposure has been traced quantitatively. A comparison between two samples of pyrethrum flowers, one rich and the other poor in pyrethrins, showed that the pyrethrin I value (as determined by the acid method), subject to a small correction, gave a good indication of the relative activities of the samples. Pyrethrum flowers, either finely or coarsely ground or as whole heads, were exposed under various conditions for different periods up to one year. When the ground flowers were exposed to sunlight and air, the loss of pyrethrin I was relatively rapid, but when they were stored in covered trays or tins, it was much slower. The rate was also slower in flowers stored as whole heads than in those that had been ground. Dusts and powders lose their pyrethrin content when exposed to sunlight in an atmosphere of air or of nitrogen. The loss is less rapid in nitrogen and appears to be due to a reaction other than oxidation by free oxygen. The loss appeared to be greater at higher temperatures. The rate of loss of the pyrethrins in a methyl alcoholic extract of flowers when exposed to sunlight and air was studied; as in the case of pyrethrum dusts, the loss of pyrethrin I was more rapid than of pyrethrin II, but the extent to which the reactions influenced each other is not known. The stabilising effect of tannic acid and hydroquinone added to a talc-pyrethrum dust was confirmed. It was shown that the addition of these anti-oxidants did not augment the initial insecticidal activity of the pyrethrins.

The insecticidal tests were carried out with Aphids, chiefly *Aphis rumicis*, L.

Stott (C. E.). *Lyctus brunneus* **Steph. in Staffordshire.**—*Ent. mon. Mag.* **70** no. 847 p. 277. London, December 1934.

Fisher (R. C.). **On the Occurrence of** *Lyctus brunneus* **Steph. in Great Britain.**—*Op. cit.* **71** no. 849 p. 42. London, February 1935.

Stott records the finding of an adult of *Lyctus brunneus*, Steph., in Staffordshire, and regards this as unusually far north for the species, but Fisher states that it has already been recorded in timber from most parts of England and from Scotland [*cf. R.A.E.*, A **19** 72, etc.].

Adkin (R.). *Laspeyresia* (*Carpocapsa*) *pomonella*, **L.: Some Notes on its Life-history in Britain.**—*Entomologist* **68** no. 861 pp. 25–26. London, February 1935.

In life-history studies of *Cydia* (*Laspeyresia*) *pomonella*, L., in England made by rearing larvae collected in apples under conditions as near to

nature as possible, the earliest date on which adults of the overwintered generation emerged was 16th June 1933 and the latest 30th July 1930, and most of them appeared during the last week in June and the first fortnight in July. Fully fed larvae are found in fruit by the middle of July. A partial second brood, which depends on the July temperature, results from these early larvae, and despite its small numbers is very destructive to the later varieties of fruit. Some larvae from the first generation and those from the second overwinter and pupate in the following spring about the end of March. Some of the larvae, however, do not pupate until the second spring ; adults were obtained on 2nd and 5th July 1934 from three larvae that had spun cocoons in 1932. On one or two occasions adults have been observed in flight between 5 and 6 p.m., and those in captivity have shown exceptional restlessness about this time. The normal flight probably takes place in the late afternoon sunshine. Eggs are deposited anywhere on the fruit, occasionally on the stalk and rarely on the leaves. The young larvae enter the fruit most often on the side but frequently through the calyx. They have also been seen to enter beside the stalk.

[Shchegolev (B. N.), Znamenskiĭ (A. V.) & Beĭ-Bienko (G. Ya.). **Щеголев (В. Н.), Знаменский (А. В.), Бей-Биенко (Г. Я.) The Insect Pests of Field Crops.** [*In Russian.*]—Super Roy. 8vo, 464 pp., 181 figs., 8 col. pls., 17 pp. refs. Moscow, St. Farm Lit. Sect., 1934. Price 9 *rub.* 25 *kop.*

This work has been compiled for the use of agricultural experts in the Russian Union and is largely based on the results of recent research in Russia and abroad. It is divided into two parts, the first of which (pp. 11–78) contains four chapters dealing respectively with the influence of natural conditions and man on the mass propagation and distribution of injurious insects, losses caused and organisation of control, methods of estimating the economic importance of insects, and methods of protecting field crops from them.

The second part (pp. 79–443) comprises notes on the morphology, distribution, bionomics and control of the insects and mites that attack field crops in the Russian Union. They are classified according to their food-plants in the nine categories, each of which receives a separate chapter.

A bibliography of Russian and foreign literature is appended, arranged according to the chapters of the book. An index is given to the pests under their Russian names only, but scientific names are also used throughout the text.

[Rimskiĭ-Korsakov (M. N.).] **Римский-Корсаков (М. Н.).** Ed. **Forest Entomology.** [*In Russian.*]—Demy 8vo, 482 pp., 4 col. pls., 159 figs., 18 pp. refs. Leningrad, Goslestekhiszdat [St. For. tech. Publ.], 1935. Price 6 *rub.* 50 *kop.* Binding 1 *rub.*

Five authors contribute to this text-book, which is based partly on the literature and partly on unpublished observations, and has been compiled primarily for the use of forestry students in the Russian Union. It opens with general information on entomology in relation to forestry, and further chapters deal with the classification, morphology and anatomy of insects, their development and propagation, and the ecology, importance, and control of forest insects.

A section of 212 pages (pp. 183–394) contains notes on the morphology, geographical distribution (with special reference to the Russian Union), food-plants, biology, economic importance, natural enemies, and control of a large number of injurious insects. They are divided into following categories: primary and secondary pests of old and established stands, and pests of young stands and pole-wood, of roots, of nursery stock, of fruit and seed, and of worked timber. A separate chapter deals with beneficial insects.

Tables in which the pests are arranged under their orders indicate the injurious stage of each, the kind of trees attacked, the character and season of the damage caused, and control measures. A list is then given of the more important insect pests arranged under the genera of the trees attacked. A number of sample forms are appended for recording data on pests.

The extensive bibliography is divided into 15 sections, each corresponding to a chapter in the manual, and indices are given to the Russian and scientific names of the pests.

[Belyaev (I. M.).] **Беляев (И. М.). Pea Weevils.** [*In Russian.*]—*Bull. moskovsk. s.-kh. obl. op. Stantz. Polevod.* 1934 no. 2 pp. 3–44, 2 figs., 5 graphs, 35 refs. Moscow, 1934. Price 1 *rub.* (With a Summary in German.)

This paper deals with observations near Moscow during 1929–31 on *Sitona* spp. damaging leguminous plants. The species involved, in order of their importance, are *S. lineata*, L., *S. crinita*, Hbst., and *S. tibialis*, Hbst., the chief food-plants of which are peas and vetch. A general account is given of the bionomics of weevils of this genus, with a list of the injurious species found in the Russian Union, showing their food-plants and distribution. The biology of the species observed near Moscow is similar to that already noticed [*R.A.E.*, A **17** 434; **23** 76]. The maximum number of eggs laid by a female in 24 hours was 76. Development from egg to adult occurred in about 10 weeks; the larval stage occupied 44 days in 1929 and 36 in 1930, and the pupal 13 and 18 days respectively. Young adults were able to emerge through a comparatively thick layer of soil if it was not too compact or too damp. In cold weather the weevils are sluggish, but if the autumn is warm they are active till November. They overwinter in clover fields or unploughed plots near peas and vetch, hibernating on the ground under snow, where the mean temperature is usually from −1 to −4°C. [30·2–24·8°F.]. In laboratory experiments all weevils survived an exposure to −8°C. [17·6°F.] for 3 hours.

In 1929 and 1930 practically no vetch or pea plant was left uninjured; in 1929 about one-eighth of the crops of vetch was completely defoliated, although most of the plants produced second shoots from the side buds. In experiments, well watered plants recovered, while unwatered ones died; the yield of seed in completely defoliated plants was decreased by 62 per cent. and by 44 in plants in which half of the leaf surface was destroyed. In June 1929 and 1930, 90 and 77 per cent. respectively of the root-nodules of plants taken from vetch fields had been injured. In 1929, 76 per cent. of the root-nodules of peas were damaged. The maximum number of larvae on a pea plant was 26, and on vetch 13. Injury to the root-nodules affects the yield of seed most. Cultural methods should aim at accumulating and preserving moisture in the soil; manuring with lime helps the root-nodules to develop. Resistant

varieties of vetch and peas should be chosen ; and early varieties of vetch should be grown on fallow land and cut when in flower, and the field should be ploughed immediately after to destroy the young larvae before they pupate and starve those that are not killed. Though late sowing safeguards the summer crops from infestation to a certain extent, early sowing produces more vigorous plants and a greater yield.

Insecticides can be used against the overwintered adults in the spring and against the young ones at the end of July and beginning of August. If a strip of the crop 16–23 ft. wide is left when the fields are mown, the young weevils will concentrate on it and may easily be killed by sprays or dusts. In experiments young vetch and peas were not damaged by dusting or spraying with calcium arsenate or with Paris green to which 3 parts of lime were added. Pure calcium arsenate at the rate of 9 lb. per acre killed 50–75 per cent. of the weevils in 3 days. The addition of lime decreased its toxicity, and a 1 : 5 dust only killed 5 per cent. Spraying with 1 or 2 per cent. calcium arsenate destroyed 60–65 per cent. of the weevils in 3 days, whereas a spray of 0·2 per cent. Paris green and 0·6 per cent. lime had killed only 35–45 per cent. on the third day. The plants were scorched by dusts or sprays of sodium fluosilicate or sodium fluoride, especially the latter, although as a 1 per cent. spray it gave 90 per cent. mortality. Sodium fluosilicate was about as toxic as calcium arsenate. There is evidence that the insecticides, especially the dusts, have a repellent action ; in many instances the weevils died without having fed on the dusted plants, being poisoned while trying to clean themselves from particles of dust. Dusts of calcium arsenate adhered to the leaves better than sprays.

Ruszkowski (J. W.). **Tableau comparatif des essais sur l'efficacité de divers moyens de lutte contre les ennemis des plantes, faits en Pologne pendant les années 1931, 1932 et 1933.** [*In Polish.*]—*Roczn. Ochr. Rosl.* (B) **2** pt. 1 pp. 1–36. Warsaw, 1934. (With a Summary in French.)

This summary of reports from Plant Protection Stations in Poland of tests of insecticides, etc. (mostly proprietary) against various pests of crops in 1931–33 [*cf. R.A.E.*, A **22** 332] is divided into two parts. In the first, brief notes, arranged alphabetically, give concentrations and quantities for the various insecticides used. The second consists of an alphabetical list of the pests, under their scientific and popular names, showing the materials used against them and those that were effective.

Ferrière (C.). **Les parasites et hyperparasites de la Cochenille de la laque aux Indes.**—*Mitt. schweiz. ent. Ges.* **16** no. 4 pp. 165–166. Bern, 15th December 1934.

This note, which is preliminary to a more detailed work, contains a list [*cf. R.A.E.*, A **23** 86] of the chief parasites attacking *Laccifer* (*Tachardia*) *lacca*, Kerr., and its predators. It includes *Microbracon greeni*, Ashm., and *Aphrastobracon flavipennis*, How., which parasitise *Eublemma* spp. and *Apanteles tachardiae*, Cam., and *A. fakrulhajiae*, Mahd., which parasitises *Holcocera pulverea*, Meyr. *T. somervilli*, Mahd., is treated as a variety of *T. tachardiae*, How.

Guéniat (E.). **Contribution à l'étude du développement et de la morphologie de quelques Elatérides (Coléoptères).**—*Mitt. schweiz. ent. Ges.* **16** no. 4 pp. 167–298, 39 figs., 84 refs. Bern, 15th December 1934.

A historical survey of published work on Elaterids is followed by a note on the classification and synonymy of *Agriotes obscurus*, L., *A. lineatus*, L., *A. sputator*, L., *Lacon murinus*, L., and *Limonius pilosus*, Leske, which injured the first crops of cereals in the Swiss Jura on what had been pasture land until 1927 or 1928. For all except *L. pilosus* an account is given of the larval and adult biology in the field and in captivity, and the data collected by the author are compared with previous records. The mature larvae of *A. obscurus*, *A. lineatus* and *A. sputator* are morphologically distinguished, and there is a comparative description of the first-stage larvae of *A. obscurus* and *A. lineatus*.

The following is taken largely from the summary : The commonest species was *A. obscurus* (71·72 per cent.), followed by *A. sputator* (24·21), *L. murinus* (3·75) and *A. lineatus* (0·32). *L. pilosus* and some other species were less important. The adults begin to come out of hibernation in mid-March, but the date of their appearance is influenced by regional climate and weather. They fed on plants or plant-parts rich in juices, such as the leaves of cereals, cereal seeds swollen before germinating, etc., and were never found feeding on animal matter. Pairing began in April. Examinations showed an average of 30 *Agriotes* larvae per square yard. Examinations in winter did not reveal any tendency of the larvae to descend to greater depths in order to avoid the cold. *A. obscurus*, *A. lineatus*, *A. sputator* and *L. murinus* oviposited readily in captivity, but the larvae were hard to rear. The habits of adults of *A. obscurus*, *A. lineatus* and *A. sputator* observed in cages did not show any biological differences, and sowings of cereals, clover and grasses were all injured in the same way. Detailed data obtained by breeding the larvae, either in pots or singly in test tubes, are given on larval characters and pupal stages. These observations, together with some recorded in the literature, show that the life-cycle may require from 3 to 6 years, the rate of larval development varying greatly with nutritive conditions and temperature.

Mesnil (L.) & Marcel (C.). **Une méthode de destruction de la mouche des endives.**—*C. R. Acad. agric. Fr.* **21** no. 2 pp. 75–80. Paris, 1935.

*Ophiomyia pinguis*, Fall., the presence of which in France was observed for the first time in May 1934 in several localities in the Seine basin [*R.A.E.*, A **22** 510] where chicory [*Cichorium intybus*] has recently been introduced, has damaged from 50 to 80 per cent. of the crop. With a view to destroying the larvae when the roots were being prepared for forcing, the leaves were cut obliquely round the collar, so as to form a cone, without injuring the terminal bud. This did not by itself reduce the number of the larvae, but allowed the liquid to reach them when the plants were dipped in a 1 per cent. solution of nicotine for at least ten minutes. Only 5 per cent. of the treated plants showed a slight degree of attack, whereas 57·5 per cent. of the controls were seriously injured. The addition of alcohol diminished rather than increased the toxicity of the nicotine. The plant should be immersed head downwards for 15–20 minutes to a depth of 1–2 inches in a zinc

bath containing a solution of 1 per cent. nicotine and 0·5 per cent. sodium carbonate. The solution can be strained and used again 3 or 4 times.

Le Goupil (—). **Les propriétés insecticides du bromure de méthyle.**—*Rev. Path. vég.* **19** fasc. 4–5 pp. 169–172. Paris, 1932.

In studies of vacuum fumigation with various substances, methyl bromide, which was originally used in combination with inflammable liquid fumigants to reduce the danger of fire, was found to possess a much higher specific toxicity than the fumigants with which it was mixed. Further tests were carried out with methyl bromide alone and diluted in a liquid possessing slight insecticidal properties, such as carbon tetrachloride. *Calandra granaria*, L., was chosen as the test insect on account of its resistance to insecticides. A few other species, notably *Tribolium*, were also used. The time of exposure to the vapour was 1½ hours in every case, but the dose varied from 2 to 13·5 oz. per 100 cu. ft. The insects were treated both isolated *in vitro* and buried in various types of commodities, in dry atmospheres as well as in varying degrees of moisture, in the presence of rags soaked in oil, and at temperatures varying from 15 to 26°C. [59–78·8°F.]. With doses below 3·5 oz. some were still alive when they were withdrawn from the autoclave, but all succumbed within a few hours. Larvae, pupae and adults still inside unsplit grain were reached just as effectively as those developing between the grains; and it is very probable that the eggs were also destroyed. Methyl bromide is toxic to man only in very large doses, and since it is very volatile and soluble in water, it is easily eliminated from fumigated commodities. It is entirely uninflammable under all conditions and can be used to reduce the danger of fire with such substances as ethylene oxide. Although its price is high, the small quantities required render the cost of using it reasonable. It does not appear to affect the germinating power of cereals, but tests have not been carried far enough in this direction to be conclusive.

Vayssiére (P.). **Les stations de désinfection des végétaux sous vide partiel.**—*Bull. Soc. Enc. Industr. nat.* 1934 pp. 295–308, 7 figs., 5 refs. Paris, April 1934. [Recd. February 1935.]

During recent years, stations with equipment for vacuum fumigation of plant material and stored products have been established at ports in Morocco, Algeria and France. In addition to other advantages of fumigating in an enclosed space, the stages of insects in which metabolism is retarded do not resist so long in a vacuum as under atmospheric pressure. The vacuum itself has no effect either on the insects or on the infested products. Insecticides used in France for vacuum fumigation are hydrocyanic acid, carbon bisulphide, ethylene oxide and methyl bromide. The extreme solubility of HCN in water makes it difficult to fumigate, even in a vacuum, compact bales, sacks or cases of goods containing appreciable moisture. In the case of fruits and green plants, the skin delays sufficiently the exchange of gases. Goods such as fruit must be wiped free of moisture before fumigation. Because of its instability, it is very difficult to remove traces of this gas after treatment. Liquid HCN tends to break down rapidly and should therefore be used within a fortnight of manufacture. Carbon bisulphide, which is chiefly used to destroy insects in stored grain,

is extremely inflammable, and as it soon breaks up into ill smelling and persistent polysulphides, must be used soon after preparation and in a chemically pure form. Ethylene oxide is heavier than air and has a great power of penetration, which is considerably increased in an atmosphere containing carbon dioxide at the rate of 7 parts to one of ethylene oxide. It also is easily soluble in water, but since it has a much higher tension than HCN, the insecticidal action is not greatly reduced on moist commodities, even at fairly low temperatures. This 1 : 7 mixture of ethylene oxide and carbon dioxide has the advantage over other fumigants for foodstuffs that it is unstable in the presence of moisture or water and breaks up gradually and in addition forms glycol ($C_2H_6O_2$), without any toxic effect on the food. The minimum dose of ethylene oxide, alone or with carbon dioxide, that has produced satisfactory results is 100 gm. per cu. m. [10 oz. per 100 cu. ft.]. Hydrocyanic acid gas or carbon bisulphide produces the appearance of death in all insects, though some may subsequently revive, while insects that have been exposed to ethylene oxide appear unaffected, but all die within 48 hours. Ethylene oxide is used on a large scale both at Le Havre and in Algeria, where it is employed in the treatment of dates, figs and tobacco. Methyl bromide [see preceding paper] kills all stages in insects at doses of 30–50 gm. per cu. m. [3–5 oz. per 100 cu. ft.], and its action is comparable to that of ethylene oxide. The vapours it gives off are not readily soluble, and it breaks up slowly in the presence of humidity, forming hydrogen bromide. Its use in the fumigation of vegetable substances with an appreciable humidity content but not a continuous cuticle is therefore inadvisable. Excellent results, however, have been secured with methyl bromide in the treatment of pears, the colour and consistency of which remain unaffected, and for which ethylene oxide is unsuitable.

The plant at Le Havre is described in detail. There are similar ones at Bordeaux and Marseilles. A project for organising the inspection and treatment of all imports of vegetables, vegetable products and foodstuffs at each great import centre is outlined.

Emon (H.). **Le Doryphore** (*Leptinotarsa decemlineata* **Say**).—*Bull. Soc. linn. Lyon* N.S. **4** no. 2 pp. 23–24. Lyons, February 1935.

When potatoes infested by *Leptinotarsa decemlineata*, Say, were sprayed in June with Bordeaux mixture (2 lb. copper sulphate and 4 lb. slaked lime to 10 gals. water), the usual treatment against mildew in France, only scattered larvae remained a few days later, and these were on leaves that had escaped treatment. A second application 11 days after the first resulted in the complete disappearance of the larvae, which abandoned the treated plants and were carried off by ants. Ten healthy larvae kept in a box with potato leaves treated with the mixture were all dead in 18 days, whereas ten kept with untreated leaves developed normally to adults. The leaves in each box were renewed every other day.

Rudelt (J.). **Ueber die Beziehungen zwischen Puppengewicht und Eiproduktion beim Kiefernspinner.** [On the Relation between pupal Weight and Egg Production in *Dendrolimus pini*.]—*Anz. Schädlingsk.* **11** no. 1 pp. 1–6, 4 figs., 11 refs. Berlin, January 1935.

It is known that eggs represent a large part of the weight of newly emerged females of *Dendrolimus pini*, L., and in the case of *Lymantria*

*monacha*, L., a relation between pupal weight and egg-production was found by Zwölfer [*R.A.E.*, A **21** 388].

This paper describes in detail experimental work in 1934 in Prussia, directed to ascertain the number of mature eggs in newly-emerged females of *D. pini*, classified into groups according to pupal weight, the course of postmetabolic development, the total egg production in the different groups, and the possibility that production of smaller (lighter) eggs by the smaller females might result in a fairly uniform number of eggs. The pupae were removed from the cocoons and kept at an average temperature of 20°C. [68°F.] until emergence. They were sorted according to sex and weighed individually or in groups. There were 5 groups with average weights ranging from 1·1 to 3 gm. per pupa.

The following is taken from the author's summary: The number of eggs brought over from the pupal stage corresponded lineally to the weight of the pupae. By prolonging the corresponding line in the graph, it appeared theoretically that females from pupae weighing 0·6 gm. would emerge without mature eggs in the ovaries. About 45 per cent. of the eggs produced by each female were brought over from the pupal stage. An equalisation of the number of eggs by the production of small eggs by small females did not occur.

Gunn (D. L.). **Bemerkung zum Aufsatz von H. Maercks : " Wird der Wasserhaushalt der Insekten durch das Daltonsche Gesetz bestimmt ? "** [A Note on Maercks' Paper " Is the Water-content of Insects determined by Dalton's Law ? "]—*Anz. Schädlingsk.* **11** no. 1 pp. 6–8, 1 fig., 5 refs. Berlin, January 1935.

Maercks (H.). **Bermerkung zu den vorstehenden Ausführungen von Gunn.** [A Note on the above Remarks by Gunn.]—*T.c.* p. 8.

Gunn discusses the experiments from which Maercks concluded that loss of water from the body of an insect at a given temperature is not proportionate to saturation deficiency, *i.e.*, does not follow Dalton's law [*R.A.E.*, A **21** 376].

From a study of Maercks' figures he suggests that at the upper and lower limits of the temperature scale rates of mortality are greatly affected by the direct influence of temperature and he finds that if conclusions are drawn from the figures obtained at more favourable temperatures the rate of mortality is in proportion to the saturation deficiency.

Commenting on this suggestion, Maercks points out that for a given temperature, even if not unfavourable, Gunn's method of demonstration does not show such a relation between saturation deficiency and mortality.

Schedl (K. E.). **Zur Biologie des Hausbockes.** [On the Biology of *Hylotrupes bajulus*.]—*Anz. Schädlingsk.* **11** no. 1 pp. 8–9. Berlin, January 1935.

Of 298 adults of *Hylotrupes bajulus*, L., collected in the summer of 1933 during the course of experiments in control, 56 per cent. were males, while in another batch of 136, 62 per cent. were males. The males lived for 7–44 days, with an average of 17·4, after capture, and the females for 7–60, with an average of 26·2. The first adults were seen in the building on 8th July and the last on 11th

August. Mating soon followed when the sexes were placed together in a confined space, and oviposition usually took place a short time afterwards. The maximum number of eggs laid by one female was 63.

Bovien (P.) & Jørgensen (M.). **Orienterende Undersøgelser over Angreb af Snudebiller** (*Apion*) **i Kløverhoveder.** [Preliminary Investigations of Attacks of *Apion* spp. in Clover Heads.]—*Tidsskr. Planteavl* **40** pp. 375–404, 23 refs. Copenhagen, 1934. (With a Summary in English.)

In Denmark, the flower-heads of red clover are attacked by *Apion apricans*, Hbst., *A. assimile*, Kirby, and *A. aestivum*, Germ. (*trifolii*, Bach.). The first two species are the more common, though *A. aestivum* predominates in some localities. Oviposition continues from early May to the end of July. *A. apricans* and *A. aestivum* lay their eggs within the florets, but *A. assimile* deposits a good many inside and between the leaves protecting the young clover-heads. It is estimated that one larva injures 6–7 ovules. The life-cycle lasts about 30 days. Eggs hatch over a very long period, and as no oviposition was observed in the laboratory, the authors conclude that Shtcherbatov was right in stating that the adults remain sexually immature throughout the summer and hibernate in a state of diapause [*R.A.E.*, A **4** 334] and that there is only one generation a year. As some weevils that had oviposited remained alive in the laboratory until 1st December, it is possible that they can survive a second winter.

White clover is exclusively attacked by *A. flavipes*, Payk., which has never been found breeding in red clover. Although the percentage of infestation is very high, the larvae, which pupate inside the florets, are easily overlooked. The eggs are invariably laid inside the florets, and the larvae bury themselves in the ovules; each damages 2–3 florets. When the seed crop is harvested, the adults migrate to neighbouring fields where they injure the new ley. *A. virens*, Hbst., has been bred from clover stems in which the larvae were found mining from ground level to about 7 inches above it, contrary to the observation of K. T. Andersen, who found them only in the root or root-collar of the plant [**20** 236]. The larvae of *Hypera* (*Phytonomus*) *nigrirostris*, F., and the gall-midge, *Dasyneura leguminicola*, Lintn., were often found in the flower-heads of red clover.

Wakeland (C.) & Haegele (R. W.). **Codling Moth Control in Idaho.** —*Bull. Idaho agric. Exp. Sta.* no. 200, 26 pp., 1 fig., 1 graph, 5 refs. Moscow, Idaho, February 1934. [Recd. 1935.]

This paper deals mainly with the control measures tested against *Cydia pomonella*, L., on apple in Idaho from 1927 to 1931. Its stages and bionomics are briefly described [*cf. R.A.E.*, A **20** 609]. A bait of ½ U.S. pint malt syrup, 10 U.S. pints water and ¼ cake compressed yeast [*cf.* **20** 583], has given the best results for timing spray applications. Chemically treated bands [**20** 403; **21** 332] are an important supplement to spraying. Home-made oil emulsions may be prepared by the casein-ammonia formula in a concentrated form [*cf.* **21** 608], or by the tank-mix method [**23** 102]. The formula given for the first method is 2 U.S. gals. water, 2·4 fl. oz. concentrated ammonia, 4 oz. finely powdered casein and 8 U.S. gals. oil. The specifications of suitable oils are tabulated and discussed. Close-cut oils ranging in viscosity from 65 to 75 seconds Saybolt with an unsulphonatable

fraction of not less than 85 per cent. have proved the most satisfactory types.

Summaries of spraying experiments carried out during 1927–31 are given, together with the dates on which sprays should be applied. Lead arsenate is recommended for all cover sprays, 2 lb. to 100 U.S. gals. water being sufficient if they are well timed. In heavy infestations or unusual conditions the rate should be increased to 3 lb. ; colloidal or soap spreaders or fish oil eliminates spotting of the fruit. Summer oils used alone did not give a high degree of control. Oil should be used only in combination with lead arsenate or substitutes at the rate of 1 gal. to 100 gals. spray. The effectiveness of the oil depends on its ovicidal properties, and it is therefore most valuable if applied at the peak of oviposition. It is considered inadvisable to use oil with lead arsenate for second brood larvae as it renders residue removal difficult. Not more than two summer oil applications should be made, and these are most effective when added to the first two cover sprays. A spray of 40 per cent. nicotine sulphate ($\frac{2}{3}$ pint) and oil emulsion (1 gal. to 100 gals.) was as effective as lead arsenate, but it is more expensive and disagreeable to use and when applied after lead arsenate renders residue removal difficult. The addition of fish oil at the rate of 1 qt. to 100 gals. lead arsenate spray gave better control in some experiments, but in general it did not increase the degree of control [*cf.* **20** 19]. If added to all cover sprays the fish oil should only be used at the rate of 1 pt. per 100 gals. or injury may be caused, but if only added to two sprays 1 qt. may be used.

The calyx spray (2 lb. lead arsenate to 100 U.S. gals. water) should be applied without fail, when about 90 per cent. of the petals have fallen and before the calyx lobes have closed. The cover sprays should be timed by bait traps placed high in the trees and well away from packing sheds and other buildings. The first should be completed within 10 days after the moths appear regularly in the traps, and the second should be completed within 10–14 days after the first. In some localities and in some seasons it is necessary to apply a third first-brood cover spray 10–18 days after the second. The first cover spray for second-brood larvae should be completed in 8 days after an increase in the number of moths appears in the traps after 1st July. The second spray when needed should be finished in 10–15 days after the first. If a third spray is necessary, it should be completed within 10 days. For thorough spraying, 20 U.S. gals. spray may be needed for a tree 20 years old, and a pressure of 350 lb. should be maintained. It is important that the whole orchard should be covered within 3 or 4 days. In early spring rough bark should be scraped from the large branches and trunks (to a depth of one or two inches below the soil) in order to destroy overwintering larvae. Chemical bands should be applied on 1st June, and should not be removed until late winter or spring. The fruit should be thinned to break the clusters, and cull apples should be destroyed. Information is given on spray residue removal [**20** 609].

Worthley (H. N.) & Blasingame (R. U.). **Corn Borer Control with Farm Machinery.**—*Bull. Pennsylvania Exp. Sta.* no. 284, 19 pp., 8 figs., 5 refs. State College, Pa, March 1933. [Recd. February 1935.]

*Pyrausta nubilalis*, Hb., is important economically in Pennsylvania only in a narrow region bordering Lake Erie, but it is firmly established

and is becoming more abundant in the centre of the State. As a result of experiments carried out during 1927–32, recommendations are given for the best use of farm machinery for the destruction of the mature larvae in maize stubble, etc., by cultural measures, which are considered the most satisfactory means of preventing a dangerous increase in infestation.

Bratley (H. E.). **Additional Notes on the Oleander Caterpillar (*Syntomeida epilais* Walker).**—*Florida Ent.* **18** no. 3 p. 39. Gainesville, Fla, November 1934.

*Syntomeida epilais*, Wlk. [*R.A.E.*, A **20** 355] has been gradually spreading northwards in Florida, where it appears to be becoming acclimatised to cooler weather and to the winters there. It was previously regarded as strictly tropical. In 1933 it caused considerable damage to oleanders (*Nerium oleander*), and during the summer of 1934 it spread rapidly northwards and was found feeding on *Carissa grandiflora* and *Bougainvillea*.

Knowlton (G. F.). **A Big-eyed Bug Predator of the Potato Psyllid.**—*Florida Ent.* **18** no. 3 pp. 40–43, 2 figs., 1 ref. Gainesville, Fla, November 1934.

Observations are recorded on the feeding of *Geocoris decoratus*, Uhler, on the adults and nymphs of *Paratrioza cockerelli*, Šulc, in vials in the laboratory. This Lygaeid is common on potato throughout Utah and is known to be predacious on small insects in nature.

Watson (J. R.). **Notes on *Nezara viridula* (L.).**—*Florida Ent.* **18** no. 3 p. 43. Gainesville, Fla, November 1934.

Prolific breeding of *Nezara viridula*, L., usually ceases in Florida in early autumn, as the adults arising from the large brood of nymphs present in September delay reproduction until the spring. In 1934, however, nymphs were numerous throughout October and most of November, the production of this extra generation being apparently due to unusually warm and dry conditions. There was also a rapid increase in the numbers of the Tachinid, *Trichopoda pennipes*, F., which parasitised 85–93 per cent. of the bugs in one locality and 50–60 in another during October, whereas it had attacked only 0·5 per cent. in August.

Thompson (W. L.). **Food Habits of *Leptoglossus gonagra*.**—*Florida Ent.* **18** no. 3 p. 46. Gainesville, Fla, November 1934.

*Leptoglossus gonagra*, F., became very abundant in a *Citrus* grove in Florida early in November 1934. It bred on the common citron (*Citrullus vulgaris*) and then spread to oranges where it caused considerable damage. A similar outbreak had occurred in another grove in the autumn of 1931.

Hoyt (A. S.). **Report of the Acting Chief of the Bureau of Plant Quarantine, 1934.**—68 pp. Washington, D.C., U.S. Dep. Agric., 1934.

The activities of the Plant Quarantine and Control Administration for the year ending 30th June 1934 are reviewed, the insects dealt with

being *Porthetria dispar*, L., *Nygmia phaeorrhoea*, Dön., *Stilpnotia salicis*, L., *Popillia japonica*, Newm., a considerable infestation of which was found for the first time in the neighbourhood of St. Louis, Missouri, outside the regulated territory, *Pyrausta nubilalis*, Hb., *Platyedra* (*Pectinophora*) *gossypiella*, Saund., new infestations of which have been recorded from Georgia, Texas, New Mexico and Florida [*R.A.E.*, A **22** 314], *Anthonomus grandis thurberiae*, Pierce, *Anastrepha ludens*, Lw., and *Parlatoria blanchardi*, Targ.

*A. ludens* was taken from about 3 times as many *Citrus* groves in the Rio Grande Valley, Texas, as in the previous year [**22** 105], and there were also found in the traps individuals of two undescribed species of *Anastrepha* as well as *A. striata*, Schin., taken for the first time in the United States.

Squire (F. A.). **A Study of** *Mormidea poecila* **Dall.**—*Agric. J. Brit. Guiana* **5** no. 4 pp. 245–252, 3 pls., 1 fig., 12 refs. Georgetown, December 1934.

In British Guiana the Pentatomid, *Mormidea poecila*, Dall., an indigenous species, normally lives in grasslands, but when they become over-populated, may lay its eggs on rice plants and cause serious damage over several successive years. One generation, which may be exceedingly numerous, is completed on rice, but a second rarely occurs and, if it does, it is small. An outbreak generally subsides in 2–3 weeks, but a total loss of grain often results. The attack generally occurs when the rice is young, and, as the grain hardens, the bug tends to move to fields where the plant is younger. The contents of young rice are completely destroyed, and older grain is attacked even by the nymphs. The leaves and stem are not injured. Malformation and discoloration persist even in milled rice and reduce the market value of the grain.

All stages are described. The male dies soon after pairing, but the female continues to oviposit for several weeks. The eggs are laid on the leaves or on the grain in masses consisting of about 18 placed in two rows, the largest deposition observed being 40 eggs and the commonest 18. The superimposition of 5 layers of eggs over the first during severe outbreaks does not interfere with hatching and gives protection against egg parasites. In laboratory observations on 14 females, the average number of eggs laid was 194·6. They oviposited for 7–28 days. In captivity all stages tend to take shelter when not feeding, and the adults sometimes fly when disturbed. A small Chalcid, the only known natural enemy, parasitised a large proportion of the eggs in the upper layer. There is only one parasite to each egg. The only practicable control measures are the destruction of the larger and more conspicuous egg-masses and collection of the bugs with hand nets.

Ancona H (L.). **Los gusanitos del maguey** *Aegiale* (*Acentrocneme*) *hesperiaris* **Kirby.** [The Agave Caterpillar, *A. hesperiaris*.]—*An. Inst. Biol. Mex.* **5** no. 3 pp. 193–200, 11 figs., 9 refs. Mexico, 1934. [Recd. February 1935.]

A detailed account is given of the morphology of the larva of the Hesperiid, *Acentrocneme* (*Aegiale*) *hesperiaris*, Wlk., with a brief description of the pupa and adult. The larvae, which are used for

food in Mexico, mine in the leaves of *Agave* spp. They hatch in December–February from eggs laid in November or December, and pupate in September–October.

Baker (J. McV.). **Algunos áfidos mexicanos.** [Some Mexican Aphids.]—*An. Inst. Biol. Mex.* **5** no. 3 pp. 209–222, 32 figs., 9 refs. Mexico, 1934. [Recd. February 1935.]

Two new genera and five new species are described. Among the other Aphids recorded is *Anuraphis padi*, L. (*helichrysi*, Kalt.), which was found in curled leaves of *Asclepias lanuginosa*.

**Insect Pests and their Control.**—*Agric. Gaz. N.S.W.* **45** pt. 12 pp. 696–700, 5 figs. Sydney, 1st December 1934.

These notes, which belong to a series on insect pests in New South Wales [*cf. R.A.E.*, A **23** 116], include brief references to the bionomics and control of *Epilachna vigintioctopunctata*, F., which occurs on tomato, potato and cucurbits [**16** 631], and of *Scolypopa australis*, Wlk., which sometimes causes slight injury to passion vines [*Passiflora*], *Citrus* and various cultivated shrubs. This Ricaniid sucks the sap from the stems and fruit. The eggs are laid in rows in young twigs, and several generations occur during the season. A dust of equal parts of pyrethrum and 2½ per cent. nicotine dust should be applied during the heat of the day before the nymphs reach maturity.

Brimblecombe (A. R.). **Queensland Pine Beetle.**—*Qd agric. J.* **42** pt. 5 pp. 546–560, 3 pls., 9 refs. Brisbane, 1st November 1934.

A comparative account is given of the bionomics of *Calymmaderus incisus*, Lea, which damages seasoned wood of hoop pine (*Araucaria cunninghami*) in Queensland, and, in less detail, of *Anobium punctatum*, De G., to which injury by it was attributed until 1931. In November 1933, however, a hoop pine floor was attacked by *A. punctatum*, and this constituted the first authentic record of this insect in timber in Queensland. All stages of both borers are briefly described. One specimen of New Zealand white pine (*Podocarpus dacrydioides*) was found to be heavily infested with *C. incisus*, this being the only record from timber other than hoop pine. Old, well seasoned timber is most susceptible to attack, and infested timber has been found to have an equlibrium moisture content of about 12 per cent. Newly hatched larvae tunnel at right angles to the surface into unbored timber. The exit holes of the adults are the only visible signs of infestation. Ultimately the wood is reduced to a spongy mass, and in many cases floors and furniture have collapsed. There is a tendency for the tunnels of *A. punctatum* to run parallel to the surface of the wood and to one another, and the damaged timber does not become spongy. *C. incisus* is apparently indigenous and specific to Queensland. In initial attacks, it lays its eggs in depressions in sawn board ends, in cracks in the boards or in the spaces between tongued and grooved boards. In subsequent generations the eggs are usually placed in old exit holes. Of 16 eggs deposited in the laboratory, 3 were laid in one opening, 4 in pairs and the remaining 9 singly. Incubation lasted about 3–4 weeks. The full grown larvae tunnel outwards, and the pupal chamber is excavated

just beneath the surface. The larval period is thought to last 10–11 months and may extend over a year. The pupal period lasts 3–4 weeks. The adult rests for a short time in the pupal cell, and pairing takes place on emergence from the timber. Oviposition may be expected shortly after the appearance of the exit holes. The adults are very active at dusk and fly about freely. They emerge from October to February, and oviposition occurs throughout this period. Experimental work indicated that larvae from late eggs may not emerge as adults until the second spring. The length of the life-cycle is probably controlled by climate and the condition of the wood. Pupation begins in spring and continues into the summer.

The adult and larval stages of both borers are attacked by the mite, *Pediculoides ventricosus*, Newp. [*cf. R.A.E.*, A **18** 188], but natural enemies are unimportant.

It is suggested that seasoned hardwood should be used for flooring instead of hoop pine. Heavily infested boards should be burned. Heavy creosote oil is effective for general application, both the liquid and the fumes from it killing borers with which they come in contact, but it leaves a stain and may affect the subsequent application of paint or varnish. Refined creosote and creosote diluted with equal parts of kerosene produce little or no stain, but give off fumes more slowly. Kerosene or turpentine alone does not penetrate well into fairly solid timber, but a mixture of these two in equal parts has given more favorable results, although it acts less quickly than a mixture containing creosote. Paradichlorobenzene dissolved in kerosene (1 lb. to 1 gal.) and liquid orthodichlorobenzene mixed with kerosene to give a 5–10 per cent. solution were also useful and left no stain. Painting appears to be the most suitable method of application.

VEITCH (R.). **Queensland Fruit Fly Control.**—*Qd agric. J.* **42** pt. 6 pp. 672–673. Brisbane, 1st December 1934.

In addition to the fruit of deciduous trees, the larvae of the Queensland fruit-fly [*Dacus ferrugineus*, F.] attack *Citrus*, papaya and mango. Bananas are seldom infested, and only if they are over-ripe. The life-cycle may be completed in a fortnight in summer. Infested fruit should be destroyed [*R.A.E.*, A **22** 61], and bait traps [**20** 156] and repellent sprays [**23** 116] should be used.

MCDOUGALL (W. A.). **The Wireworm Pest and its Control in central Queensland Sugar-cane Fields.**—*Qd agric. J.* **42** pt. 6 pp. 690–726, 27 figs., 24 refs. Brisbane, 1st December 1934.

A detailed account is given of the bionomics and control of *Lacon variabilis*, Cand., the larvae of which attack sugar-cane in badly drained areas in central and southern Queensland [*cf. R.A.E.*, A **20** 187 ; **21** 152 ; **22** 623]. It has not been recorded elsewhere as a pest, though it occurs throughout Australia. All stages are described, and the larvae and adults are compared with those of other Coleoptera that occur in sugar-cane fields in Queensland.

In the laboratory the females usually deposited eggs singly on the soil surface or in batches of 2–23 in crevices at a depth not exceeding 2 inches. The eggs withstood immersion in water for five days and

hatched after having been placed in soils which ranged from moderately dry to those containing free water. The young larvae soon disperse through the upper 2–3 inches of soil. Pupation takes place in earthern cells at depths which vary, with the moisture conditions of the soil, from 1 inch after showery weather to 7 inches in dry conditions.

Adults are found in greatest numbers in suitable localities after the heavy rains in November or December. At other times they are seldom seen in the field. They undoubtedly migrate slowly from the original habitat of swampy grassland to badly drained sugar-cane fields. It appears, however, that their migration from one locality to another in badly drained cultivated areas is even slower, though once the species is present in cultivated areas its population density may increase. White to yellowish light does not attract the adults. They are not directly injurious to cane, and it is thought that in the field their chief food is the softer underground parts of plants. The larvae seem to thrive in any type of soil, provided that it is ill drained. They rise suddenly to the surface after rain and so damage cane planted during dry weather. In one case all the soft eyes in damp trash to a height of 6 inches above the ground were injured, and in three instances the larvae were found in eyes. They have not been found in the clay subsoil. In addition to feeding on the cane, the larvae also ingest soil, and sliced potatoes and sprouting cereals have been used successfully as food in the laboratory. Healthy larvae have been found in cultivated fields submerged for as long as four weeks.

Small field trials with various chemicals gave poor results, and mechanical control is of uncertain value. There are no important natural enemies. Preference is therefore given to simple cultural methods. Low-lying fields should be permanently drained, but if this is not practicable, the fields should be thoroughly drained as early as the mid-summer rains and kept drained until they are ploughed during the month before planting. If fields are not drained at all, planting should be left as late as possible.

LEVER (R. J. A. W.). **Insects of the Coconut Palm in the British Solomon Islands.—List 3.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 3 pp. 7–8. Tulagi, July 1934. [Recd. January 1935.]

Of the insects recorded in this third list [*cf. R.A.E.*, A **21** 481 ; **22** 64], *Xixuthrus costatus*, Montr., which occurs in the trunks of coconut palms, is the only species proved to be a pest. *Tribolium castaneum*, Hbst., *Necrobia rufipes*, DeG., and *Oryzaephilus* (*Silvanus*) *surinamensis*, L., occur in copra, and *Carpophilus dimidiatus*, F., is found both in copra and coconut flowers.

LEVER (R. J. A. W.). **Original Food Plants of Local Coconut Insects.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 3 p. 8. Tulagi, July 1934. [Recd. January 1935.]

Some of the instances here recorded of coconut pests infesting indigenous palms in the Solomon Islands have already been noticed [*R.A.E.*, A **20** 722 ; **21** 207, 482]. *Rhabdocnemis obscura*, Boisd., has been found on *Ptyschosperma* sp. in the jungle, and *Diocalandra frumenti*, F., on *Nipa fruticans*.

Lever (R. J. A. W.). **White Ants and Local Resistant Timbers.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 3 p. 18. Tulagi, July 1934. [Recd. January 1935.]

*Coptotermes solomonensis*, Snyder, is very destructive to timber in buildings in the Solomon Islands. It appears to be favoured by damp soil, but has been observed to construct a runway from the soil up a foot-high concrete ledge and work into the wood above it. Of the local timbers, *Intria bijuga*, and more particularly *Guettarda speciosa*, are known to be resistant, and *Calophyllum inophyllum* and *Thespesia populnea* are thought to be actually immune. Non-resistant timber is best treated by applying a double coating of hot tar, or by soaking in sodium arsenite, and the colonies may be exterminated with Paris green powder.

Lever (R. J. A. W.). **Corrections and Additions to Determinations of Local Insects.**—*Brit. Solomon Is. agric. Gaz.* **2** no. 3 pp. 18–19. Tulagi, July 1934. [Recd. January 1935.]

As a result of identifications made by the Imperial Institute of Entomology, it is stated that the coconut leaf-beetle in the Santa Cruz Islands is *Promecotheca opacicollis*, Gestro, and that its parasites are the Trichogrammatid, *Oligosita utilis*, Kow., and the Eulophid, *Closterocerus splendens*, Kow., which attack the eggs and larvae respectively [*cf. R.A.E.*, A **22** 63]. A parasite of the puparia of *Phaonia corbetti*, Malloch, which breeds on the inflorescences of the nipah palm [*Nipa fruticans*] [**19** 295], is *Spalangia muscidarum*, Richmond.

**Plusieurs procédés de lutte contre les charançons.**—*Rev. agric. Nouvelle Calédonie* 1934 pp. 1657–1663. Nouméa, December 1934.

In the first of two papers C. Frappa gives an account of tests carried out in Madagascar in 1932–33 to determine the effect of heat upon *Calandra oryzae*, L., and its value in disinfecting stored grain intended for export. Exposure to 52°C. [125·6°F.] for 5 minutes or 59°C. [138·2°F.] for 4 minutes caused 100 per cent. mortality.

In the second paper G. Barathon states that farmers in New Caledonia get a high degree of control by crushing and rubbing *Datura stramonium*, a local plant, on the floors and lower part of the walls of the granaries. No weevils have been seen in these granaries since 1925, and when sacks covered with weevils have been brought back from the mills, they have all been driven away in a few hours by the odour of the plant juices. This odour, however, does not affect the grain.

Cheng (T. S.). **A preliminary Report on the Study of a Chinese Insecticide " Liu-Kung Teng "** (*Tripterygium wilfordii*, **Hook**). [*In Chinese.*]—*J. agric. Ass. China* no. 118 pp. 67–74, 4 maps. November 1933. (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 190. Canton, 1st January 1935.)

An extract of the cortex of the root of *Tripterygium wilfordi* is reported to be of value as a contact insecticide against insects attacking vegetables. Descriptions of the plant and its physical and chemical characteristics are given, together with a map showing where it is produced in Chekiang.

Li (Feng-swen). **Preliminary Notes of the Life History of the Cotton Cutworms,** *Agrotis* **spp.** [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 31 pp. 608–610. Hangchow, 1st November 1934. (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 205. Canton, 1st January 1935.)

An unidentified species of *Agrotis*, which has one generation a year in China and hibernates in the larval stage, causes serious damage to young cotton plants from the beginning of May to mid-June. The prepupal stage lasts from towards the end of June to mid-September. The adults emerge in early October and oviposit over a period of 10 days. One female lays an average of 435 eggs. The eggs hatch at the end of October. *A. ypsilon*, Hfn., which has three generations a year, also causes severe injury to young cotton plants in May. One female lays about 800 eggs.

Lui (Kwo-si). **Preliminary Notes on the Cotton Boll-worm** (*Chloridea obsoleta* **Fab.**). [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 27 pp. 528–531. Hangchow, 21st September 1934. (Abstr. in *Lingnan Sci. J.* **14** no. 1 pp. 207–208. Canton, 1st January 1935.)

In China, larvae of *Heliothis* (*Chloridea*) *obsoleta*, F., appear on cotton early in July when it is a little over 3 ft. high. They feed on the foliage, buds, flowers and bolls. They rest on the lower surface of the leaves or in the soil, where they pupate at a depth of 2–3 ins. The eggs are laid on the stems and hatch in 3 or 4 days. The larval and pupal periods average 11 days each. Heavily infested blossoms and bolls fall; large bolls do not drop immediately, but the infested parts decay. Control measures recommended are hand-picking, ploughing, and the use of arsenical sprays, trap crops and early varieties of cotton.

Ma (Tsing-chao). **Drought and Insect Outbreak.** [*In Chinese.*]—*Ent. & Phytopath.* **2** nos. 24 & 25–26 pp. 473–482, 499–517, 2 figs., 162 refs. Hangchow, 21st August & 11th September 1934. (With a Summary in English.) (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 209. Canton, 1st January 1935.)

The relation of drought to insect outbreaks is discussed from the literature. Its effect on insects varies greatly with different species and stages, and with other factors, including food and temperature. Mortality results from loss of water-content or the hardening of the egg or pupal coverings, which prevent hatching or emergence. Insects that have become adapted to drought aestivate. Aestivation is due to a change in the water content; it may or may not occur periodically, and its duration is variable. If its water content is abundant, the rate of an insect's development is accelerated by low humidity, which causes evaporation of free water; on the other hand, if the water content is about normal, development is delayed by low humidity. The physiology of phytophagous insects is greatly influenced by the effect of drought on the water content, chemical composition and hardness of the tissues of their food-plants. An alteration may occur in the behaviour of insects feeding on such plants, as in the development of different phases in locusts. In the case of Lepidoptera, low humidity greatly influences the body temperature, quality and quantity of silk, number of instars and generations, quantity of eggs, duration of hibernation, resistance to cold, and winter mortality. Adaptation to

humidity governs the distribution and migration of certain insects, such as locusts. Relative humidity has a greater effect on insects than absolute humidity, evaporation, rainfall, etc.

Tsai (Pang-Hwa) & Wang (Chung-ni). **On the Change of Sex-ratio in Insects, with Reference to its Significance on the Insect Epidemiology.** [*In Chinese.*]—*J. agric. Ass. China* no. 118 pp. 75–93, 13 figs. November 1933. (With a Summary in German.) (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 219. Canton, 1st January 1935.)

Outbreaks of certain insect pests can usually be forecast from the nature of the sex-ratio in the preceding year. According to the available literature, the sex-ratio is influenced by temperature, humidity, nutrition and the time of maturation of the insects concerned. A study of *Schoenobius bipunctifer*, Wlk., indicated that the proportion of females was comparatively high in the vicinity of Hangchow in 1933 and that an outbreak might be expected in 1934 unless the females decreased in late autumn. In southern Formosa the females are usually considerably more abundant than the males in autumn and the following spring, but an outbreak is avoided because their numbers are suddenly reduced in spring by unfavourable weather and cultural operations.

Yang (Chio-ching). **Some Preliminary Notes on Stored Grain Insects of Sioshan, Chekiang, May 1934.** [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 21 pp. 416–421, 5 refs. Hangchow, 21st July 1934. (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 223. Canton, 1st January 1935.)

Examination of 60·5 pints of grain stored in 50 houses indicated that on an average 1 pint contains 10 *Calandra oryzae*, L., 3 *Tenebroides mauritanicus*, L., 2 *Tribolium confusum*, Duval, 1 *Oryzaephilus* (*Silvanus*) *surinamensis*, L., 14 *Rhizopertha dominica*, F., 2 *Carpophilus dimidiatus*, F., and 1 *Typhoea* (?) *stercorea*, L. (*fumata*, L.). *Calandra oryzae* destroys as much as 20–50 per cent. of the grain. In addition, *C. granaria*, L., *Tribolium castaneum*, Hbst. (*ferrugineum*, F.) and *Aphomia gularis*, Zell., were also found. The present methods of storing grain are considered responsible for great loss.

Yu (Swett T.). **The Lac Insect** (*Tachardia lacca* **Kerr**). [*In Chinese.*] —*Agric. Inform.* no. 173-174, pp. 3-24, 5 figs. 1934. (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 224. Canton, 1st January 1935.)

The characters of the genus *Laccifer* (*Tachardia*) are described, and a key is given to the four commonest species found in subtropical regions, *viz.*, *L.* (*T.*) *conchiferata*, Green, *L.* (*T.*) *lacca*, Kerr, *L.* (*T.*) *albizziae*, Green, and *Tachardina* (*T.*) *minuta*, Morr., which is regarded as congeneric with the others. The biology, morphology and natural enemies of *L. lacca* and the development of stick lac are dealt with in detail.

Shen (T. H.) & Shen (H. N.). **Breeding Rice in China for Resistance to the Stem Borer.**—*Bull. Coll. Agric. For. Nanking* N.S. no. 20, 12 pp., 1 fig., 6 refs. Nanking, June 1934. [Recd. February 1935.]

Investigations were undertaken in Nanking during 1929–33 on the susceptibility of different varieties of rice to infestation by *Chilo*

*simplex*, Butl., and *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), both of which, particularly the latter, cause great loss, chiefly to the medium-late and late varieties. One strain (1–3–86) consistently showed the lowest percentage of damage over 5 years, but in 1933 another (Ningpo Sen), which formed heads 10 days later than the other strain, was even less damaged. In estimating damage, full as well as empty heads on infested culms should be taken into account. An empty head represents total loss but full heads on injured culms may be considered as representing partial loss and consequently as indicating tolerance. A resistant strain should thus have a low percentage of injured culms with either empty heads or full ones.

Ma (Tsing-chao). **Observations on a Bamboo-shoot Borer, *Atrachea vulgaris distincta* Warren, in Hangchow.** [*In Chinese.*]—*Ent. & Phytopath.* **2** no. 36 pp. 709–715, 1 fig., 22 refs. Hangchow, 21st December 1934. (With a Summary in English.)

The larvae of a Noctuid, *Atrachea vulgaris distincta*, Warren, appear in most of the bamboo forests in Hangchow from early May to mid-June and feed in the young stems or shoots, causing them to die back. They pupate in the soil. About 30 per cent. are parasitised by *Apanteles* sp., up to 47 larvae of which may complete development in a single host. The adults emerge early in July. The best method of control is cutting off the infested shoots for several years.

Uchida (T.). **Einige Ichneumonidenarten aus China.** [Some Chinese Ichneumonids.]—*Insecta matsum.* **9** no. 1–2 pp. 1–5. Sapporo, November 1934. [Recd. February 1935.]

The distribution and synonymy of 14 species are briefly noted. They include *Stenaraeoides* (*Mesostenus*) *octocinctus*, Ashm., from *Dendrolimus punctatus*, Wlk. [*cf. R.A.E.*, A **22** 549]; *Xanthopimpla punctata*, F., from *Margaronia pyloalis*, Wlk., and *Parnara guttata*, Brem.; *Zacharops narangae*, Cush., from *Naranga aenescens*, Moore; *Mesochorus facialis*, Bridgm., from *Apanteles sugae*, Wat.; and *Ephialtes chui*, sp. n.

Watanabe (C.). **On Two Braconid Parasites of Sugar Cane Pests in Formosa.**—*Insecta matsum.* **9** no. 1–2 pp. 8–11. Sapporo, November 1934. [Recd. February 1935.]

Descriptions are given of *Shirakia yokohamensis*, Cam. (*Bracon seitzi*, Cam.) reared from *Scirpophaga nivella*, F., and of *Macrocentrus jacobsoni*, Szépl., from *S. nivella*, *Chilo infuscatellus*, Snell., and *Diatraea venosata*, Wlk.

Cushman (R. A.). **New Ichneumonidae from India and China.**—*Indian For. Rec.* **20** pt. 12, 8 pp., 1 fig. Delhi, 6th December 1934. Price 5*d*.

The new Ichneumonids described from India are: *Pristomerus laccae*, sp. n., reared from lac [*Laccifer lacca*, Kerr.], in which it was undoubtedly parasitic on a Lepidopterous predator; *Microtoridea secunda*, sp. n., and *Mesochorus indica*, sp. n., both from *Apanteles machaeralis*, Wlkn., parasitising *Hapalia machaeralis*, Wlk., on teak; and *Cremastus hapaliae*, sp. n., and *Anomaloctenus melleus*, gen. et sp. n.,

both from *H. machaeralis*. *Monomacrodon bicolor*, gen. et sp. n., is described from China. Both the new genera belong to the tribe Paniscini.

FUKUSHI (T.). **Studies on the Dwarf Disease of Rice Plant.**—*J. Fac. Agric. Hokkaido Univ.* **37** pt. 2 pp. 41–164, 6 pls., 2 figs., 2 fldg tables, 238 refs. Sapporo, December 1934.

Detailed information is given of investigations on dwarf disease, a virus disease of rice in Japan, with descriptions of the intracellular bodies associated with it in the infected plants, and an account of transmission experiments with its vector, the Jassid, *Neophotettix bipunctatus* (*apicalis*) *cincticeps*, Uhl. [*R.A.E.*, A **22** 59, 374].

ODA (F.). **Biology of** *Pseudococcus* **sp. of Pear and its Control by Hot Water.** [*In Japanese.*]—*Pract. Gdng* **17** no. 12 pp. 742–747, 10 figs. Tokyo, December 1934.

In the Fukuoka Prefecture (Kyushu), a species of *Pseudococcus* has recently been found infesting about 30 per cent. of the pear trees and causing considerable injury. It also occurs on persimmon. It attacks the basal parts of the stems, where it makes galls, and in August feeds on the fruits. There are three broods a year, hatching in June, August and October, and the winter is usually passed in the larval or adult stage, though all stages may be seen at any season. The female produces about 200 eggs. Pouring nearly boiling water round the base of the stems is an effective control measure and does not harm the trees.

SUZUKI (A.). **On** *Neodiprion sertifer* **Geoff.** [*In Japanese.*]—*Oyo-Dobuts Zasshi.* **6** no. 5–6 pp. 254–272, 6 figs. Tokyo, 1934.

Descriptions, with notes on the anatomy of the adult and larva, are given of the stages of *Diprion* (*Neodiprion*) *sertifer*, Geoffr. [*R.A.E.*, A **23** 15]. It feeds on pine needles, chiefly on young trees, and has one generation a year in Japan. The larvae hatch from the overwintered eggs in late April and congregate in groups of about 34. The males moult four times and the females five. After feeding for about 4 weeks, the larvae spin cocoons, mostly among fallen leaves or branches. Pupation occurs in late September or October, the prepupal and pupal periods lasting about 21 weeks and 17 days, respectively. The adults emerge in October, and live about 8 days. The female lays an average of 36 eggs in the needles ; each needle usually contains 5 eggs. The larvae are parasitised by *Exenterus* spp.

II (N.). **On the Life History and Habits of** *Arge similis* **Vollenh., a Pest of** *Rhododendron*. [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **6** no. 5–6 pp. 273–289, 3 figs. Tokyo, 1934.

The sawfly, *Arge similis*, Voll., feeds on various species of *Rhododendron* in Japan [*R.A.E.*, A **23** 15], but prefers those with few hairs on the leaves. There are usually 3 generations annually, and the adults, which live for a maximum of 19 days, may be seen from late April to early October. The female lays 20–88 eggs in the young leaves, and only males are produced parthenogenetically. The eggs, which are commonly attacked by a Eulophid, probably *Ootetrastichus* sp., in July

and August, hatch in 8–11 days. There are 5 or 6 instars in the male larvae, and 6 or 7 in the female. The prepupal and pupal stages last 7–9 and 6 days in the females, and 5–11 and 3–4 days in the males. The larvae are parasitised by an Ichneumonid, a Tachinid, and an entomogenous fungus, and are destroyed by Mantids and spiders.

TAKAHASHI (S.) & UCHIUMI (M.). **Studies on *Attagenus piceus* Oliv., a Pest of Raw Silk. First Report.** [*In Japanese.*]—*Res. Bull. Silk Insp. Sta. Yokohama* **1** no. 5 pp. 163–220, 2 pls. Yokohama, November 1934.

*Attagenus piceus*, Ol., all stages of which are described, causes considerable injury to raw silk in Japan. It has usually one, but sometimes two generations a year, and it hibernates in the larval and occasionally in the adult stage. The beetles prefer dry dusty places, especially soil dusts, and many are found in crevices in the floors of silk factories. They seem to feed mostly on dry animal matter, preferring dried pupae of silkworms [*Bombyx mori*, L.], but they also attack rice and artificial silk. At a constant temperature of 25°C. [77°F.] the female adults lived for 36 days and the males for 38, while at 28°C. [82·4°F.] both males and females lived for 30 days, and oviposition began 3·7 days after emergence. At room temperatures the females each lay about 150 eggs, or less than half as many if they are not fed. At 25°C., 28°C. and 30°C. [86°F.], averages of 128·3, 106·45 and 88·7 eggs were laid in 28, 18 and 17·3 days. The egg stage lasted 6–7 days in early July, 12–16 in late May and early June, and 8–9, 6–9, and 5–6 days at 25, 28 and 30°C., respectively. The larvae hardly moved at 2°C. [35·6°F.], but were quite active at 5°C. [41°F.]. The larval stage averaged 289·3 days at 25°C., and 298·3 at 28°C., and the pupal stage lasted about a week. A list of 28 insects attacking raw silk in Japan is appended.

HART (P. C.). **Topboorderbestrijding en tuinproductie.** [Tip Borer Control and Sugar Plantation Production.]—*Arch. Suikerind. Ned.-Ind.* 1934 pp. 1017–1038; also as *Meded. Proefst. Java-Suikerind.* 1934 no. 27. Surabaya, 1934.

In view of the present low prices of sugar it may be doubted if the cost of combating the sugar-cane tip-borer [*Scirpophaga intacta*, Sn.] in Java is warranted by the resultant increase in crop yield. As a guide to this question, the author records and discusses the increase in yields for plantations where measures were taken during 1930–34. An increase in sugar production of from about 660 lb. to 2,300 lb. per acre was obtained in plantations where the infested shoots were removed.

RAMAKRISHNA AYYAR (T. V.) & MARGABANDU (V.). **Hymenopterous Parasites of Economic Importance in S. India.**—*Madras agric. J.* **22** no. 12 pp. 430–446, 18 refs. Coimbatore, December 1934.

A list is given of a large number of Hymenopterous parasites occurring in southern India arranged under their hosts, most of which are Lepidoptera, with brief notes on some of those that are of value in the control of crop pests. Previous lists have already been noticed [*R.A.E.*, A **16** 48, etc.].

Atkinson (D. J.). **Entomological Research.**—*Rep. Silv. Ent. Burma 1933–34* pp. 45–53. Rangoon, 1934.

Information is given on the biology of *Xyleutes ceramicus*, Wlk. (beehole borer) on teak [*Tectona grandis*] in cages and on experimental plots in Burma during 1933–34 and on the results of a survey of the greater part of the Province in which planting operations have been or might be undertaken, to determine the incidence of infestation. One individual has been reared for the first time from egg to adult, a male emerging on 2nd April 1934 from eggs laid between 30th March and 2nd April 1932. Larvae placed in cages when aged about 6 weeks [*cf. R.A.E.*, A **22** 123] are now in the course of their second year of development. One adult of each sex completed its life-cycle in one year. It appears probable that most of the eggs are normally laid under creepers, in partly closed old holes and other similar fissures [*cf.* **21** 261]. The constant discovery of new holes up to November at least indicates that the larvae wander. The total number of larvae in the plots was greater in August than in June ; this may be because the period of adult emergence is longer than was previously thought, but it is more probable that the larvae bore in the bark and bast for several weeks before penetrating into the sapwood or ejecting noticeable quantities of frass.

In the laboratory, 14 generations of *Hapalia machaeralis*, Wlk., and *Hyblaea puera*, Cram., developed between March 1933 and April 1934. No alternative food-plants of the former have been found in Burma, though *Callicarpa arborea* and *C. macrophylla* have been recorded at Dehra Dun [*cf.* also **22** 591], and it is able to maintain itself throughout the year on teak alone, though heavy mortality occurs during the leafless period when it depends on coppice shoots, etc. [**22** 123]. One of the Chalcidoid parasites [*loc. cit.*] has been reared on the eggs of several other species. All stages of *Hyblaea* were again absent in the field from mid-December to the end of March. It seems likely that this species, which, where it hibernates, does so as an adult, oviposits and thus carries on the generations without a break if suitable leaves are available ; otherwise it conceals itself until foliage, probably not of teak, is again present. *Hapalia*, which hibernates as a larva, seems to be controlled entirely by climatic conditions, and where these do not allow a seasonal diapause, the greater part of the population dies annually.

Bundles of freshly cut dunnage bamboos were immersed for 2–12 weeks in fresh or brackish water and sticks from them were then placed in cages with 500 individuals of *Dinoderus ocellaris*, Steph. Untreated material not subject to forced attack was completely pulverised by December, whereas practically all the treated sticks were still in good condition in June, though infestation was progressing slowly in some lots and reproduction had occurred in material treated for less than a month. A second series of experiments confirmed these results. The soaking causes the sugar content to decrease rapidly and the starch content to increase, and it appears that sugars form the attractive constituent.

A total of 17,000 resting adults of the Cassidid, *Calopepla leayana*, Latr., were collected and destroyed during 20th April–20th May, and during the following month, after the appearance of the active adults, a further 266,000 were collected by hand and egg-masses were destroyed where practicable. Slight damage to *Gmelina arborea* was noticeable

during July, when the majority of the larvae had pupated, and 37 per cent. of the pupae were parasitised by *Brachymeria* sp. ; by September the trees were free from infestation and in full foliage. An unidentified Chalcidoid parasite of the eggs [**22** 123] completes its life-cycle in 8–9 days and apparently hibernates as an adult, since adults of the last artificially bred generation lived for a maximum period of 102 days instead of 20–30. The Proctotrupid parasite of the eggs of *Aspidomorpha miliaris*, F. [*loc. cit.*] was successfully received from Malaya, but the eggs of *Calopepla* are apparently unsuitable for its development, and the discovery of the indigenous egg-parasite now renders it less desirable. *Aspidomorpha* itself was introduced for the maintenance of the Proctotrupid during the course of the experiments ; it might possibly be of great value as an alternative host for the egg and pupal parasites of *Calopepla*. The probability of its being attacked by *Brachymeria* is based on the fact that this parasite readily infested the prepupae of another Cassidid (? *Prioptera*), which defoliates *Ipomaea bona-nox*. Experimental breeding of *Xyleutes persona*, Le Guillou, on *Cassia fistula* showed that the life-cycle may last at least two years and that the larvae may live for three. The moths again continued to emerge late in the season [*loc. cit.*].

Bredo (H. J.). **La lutte biologique et son importance économique au Congo belge.**—*Bull. agric. Congo belge* **25** no. 1 pp. 3–20, 6 figs., 15 refs. Brussels, March 1934. [Recd. January 1935.]

Proposals for the biological control of certain pests in the Belgian Congo are introduced by a general review of the principles governing the breeding and use of parasites [*cf. R.A.E.*, A **18** 499]. Mechanical and chemical control of *Platyedra gossypiella*, Saund., which is now present in almost all the cotton plantations, have proved impracticable, and since larvae in the field, whether on cotton or on the alternative food-plants to which they migrate between the two cotton-growing seasons, can only be reached by natural enemies, it has been decided to import *Microbracon kirkpatricki*, Wlkn., which has been observed in the Sudan to breed in the dead season on the larvae of *Crocidosema plebeiana*, Zell., on *Abutilon* sp. [**20** 622, etc.].

Little is known of the biology of *Stephanoderes hampei*, Ferr., and *S. subvestitus*, Egg., in the Belgian Congo, where both are serious pests of coffee. *Heterospila coffeicola*, Schmied., and *Prorops nasuta*, Wtstn., the two principal parasites of *S. hampei*, both occur in some districts of the Belgian Congo, and it is proposed to breed and introduce them into other areas [*cf.* next paper]. As, however, all attempts to breed *H. coffeicola* artificially have hitherto failed, little is known of its biology except that one larva destroys about 15 eggs and larvae of *S. hampei*.

Injury to cotton by *Sylepta derogata*, F., is slight in Ubangi, where its parasite, *Apanteles sagax*, Wlkn., occurs. It is proposed to breed this Braconid locally for introduction into cotton growing areas where it is not present.

Sladden (G. E.). **Le *Stephanoderes hampei* Ferr.**—*Bull. agric. Congo belge* **25** no. 1 pp. 26–77, 13 figs., 4 pp. refs. Brussels, March 1934. [Recd. January 1935.]

A detailed account, compiled mainly from the literature, is given of the biology of *Stephanoderes hampei*, Ferr., all stages of which are described, and of the measures employed for its control, particularly

in the Netherlands Indies. Many cultural, mechanical and chemical measures are arranged according to the different stages of the coffee crop to which they are applicable. One section of the paper deals at length with natural enemies, including fungous diseases and insect predators and parasites [*cf. R.A.E.*, A **11** 456; **12** 200, 201, 469; **14** 225, etc.]. The two most effective insect parasites of *S. hampei* are already present in the neighbourhood of Stanleyville, *Prorops nasuta*, Wtstn., having been recorded for the first time on coffee in one plantation in 1931 [**21** 424] and *Heterospila coffeicola*, Schmied., in another in 1932. According to J. Ghesquière [**21** 155] both these parasites of *S. hampei* were present in large numbers in several localities in the Belgian Congo in 1924.

Data are given of tests carried out in 1932 and 1933, in which numerous samples of different varieties of coffee, in the green, red and black stages, were collected in the neighbourhood of Stanleyville in order to determine the average infestation by *S. hampei* and to recover any parasites that might be present. According to these data, although not conclusive, *P. nasuta* is the most widely distributed parasite, the multiplication of *P. nasuta* and *H. coffeicola* is little affected by the regular collection of ripe coffee berries, the combined presence of these two parasites does not restrict the development of the Scolytid, and the low percentage of infestation in some neglected plantations is not always or entirely due to them. It would be possible to increase the efficiency of the parasites by breeding and liberating them. Although *H. coffeicola* is probably the more active, it will not live in captivity and could not, therefore, be bred in the laboratory; nor is it possible to release it by means of cages, as the host and parasite are of the same size and wire screen of a mesh that would allow the one to pass would also release the other. If infestation is above 5 per cent., however, the fact that the release of *H. coffeicola* by means of infested coffee involves also that of a few Scolytids need not be taken into consideration. A small undetermined Hymenopterous insect was also present in all the samples of coffee examined and may be another parasite of *S. hampei*. It is concluded from the knowledge at present available that parasites can only be considered auxiliary to the control of *S. hampei*, and a programme comprising various measures that have proved effectual against the Scolytid in Java is drawn up for the Belgian Congo.

Wilbaux (R.). **Composition et propriétés toxiques des graines et des feuilles de** *Tephrosia vogelii* **Hook F.**—*Rev. Bot. appl.* **14** no. 160 pp. 1019–1027, 22 refs. Paris, December 1934.

A detailed analysis was made in 1934 of the chemical composition and toxic properties of seeds and leaves of *Tephrosia vogeli* [*cf. R.A.E.*, A **23** 80] that had been harvested in the Belgian Congo in 1912. Oil extracted from these seeds was also analysed, and the analysis compared with that of oil from seeds harvested in 1932. A great increase in acidity and a considerable decrease in iodine content was found in the oil from the older seeds. The toxicity of *T. vogeli* is due to the presence of deguelin, which is an isomer of rotenone, and tephrosin, which is less active. The distribution in the plant of these principles, which are almost or entirely absent from the roots and stems, is closely related to that of fatty matter. The analyses show that the proportion of fatty matter in fresh and dry leaves of *T. vogeli* respectively is 2·11 and 2·26

per cent., the corresponding percentages for the seeds being 10·82 and 11·85.

Tests of the toxicity of the seeds and leaves that had been preserved for 22 years were carried out against molluscs, insects and bacteria. An emulsion consisting of an acetone extract of dried seeds and leaves in solution in acetone with the addition of water to form a spray on the basis of 0·5 per cent. or less dry vegetable matter, was effective against the larvae of *Pteronus ribesii*, Scop., whereas the larvae of *Calliphora* sp. and *Syrphus* sp. [*cf.* **17** 346] proved resistant.

**La teigne de la pomme de terre** *Phthorimaea operculella* **Zell.**—*Memento Serv. Déf. végét. Dir. gén. Agric.* [*Maroc*] no. 25, 7 pp., 2 pls. **Le phylloxera de la vigne** *Phylloxera vastatrix*, **Planchon** (**Hémiptéres Chermesidae**).—*Op. cit.* no. 26, 12 pp., 4 pls. Rabat, November 1934.

The distribution, bionomics and control of the Tineid, *Phthorimaea operculella* Zell., on potato, and of *Phylloxera vitifolii*, Fitch (*vastatrix*, Planch.) on vines, are reviewed for the guidance of cultivators in Morocco. Both insects are briefly described. *Omorgus phthorimaeae*, Cush., has been observed as a parasite of *P. operculella* in Morocco, but it is of little importance.

Spoon (W.). **Bewaren van Derriswortel en Derrispoeder.** [Storage of Derris Roots and Derris Powder.]—*Ber. HandMus. kolon. Inst. Amst.* no. 90, 12 pp., 3 figs., 6 refs. Amsterdam, 1935. (Repr. from *De Indische Mercuur* 23rd January 1935.)

In connection with investigations on derris [*R.A.E.*, A **22** 462, etc.] and in view of enquiries by agriculturists in Holland as to whether derris roots and powder could be kept from one season to another without loss of quality, the author publishes his observations over three years on four lots of derris roots, two of which were from the Netherlands Indies and two from Malaya. The percentages of moisture, ether extract and rotenone did not vary much. One sample of powder, for instance, had a rotenone content of 4·1 per cent. in July 1933 and another from the same bale had 4 per cent. in June 1934. It is concluded that roots and powder will keep for any reasonable period if stored in a dry, cool place shielded from air and light. Well closed containers are therefore needed.

Hayes (W. P.). **Biological Races of Insects and their Bearing on Host Plant Resistance.**—*Ent. News* **46** no. 1 pp. 20–23. Philadelphia, Pa, January 1935.

In discussing attempts to obtain strains of cereals resistant to various insect pests, the author points out that plants that produce good yields despite insect damage may be as valuable as those that are immune. He considers that since both these factors are heritable in the plant, various degrees of ability to injure or attack may be heritable in the insect ; whether this ability is a genetic character or is induced by ecological conditions, it remains pertinent that a so-called resistant food-plant will not retain its resistance under all conditions. The breeding of resistant food-plants is greatly complicated by differences

occurring in biological races of the various injurious species of insects, and it is imperative to obtain a greater knowledge of their genetics and of the development and cultivation of tolerant plants.

HARUKAWA (C.). **Effect of Fumigation with Chloropicrin upon the Germination of Seeds.** [*In Japanese.*]—*J. Plant Prot.* **22** no. 1 pp. 7–15. Tokyo, January 1935.

Germination of soy beans, except when they had been recently harvested, was scarcely affected by fumigation with chloropicrin at the rate of 1 lb. per 1,000 cu. ft. for 48–72 hours. Maize fumigated with $\frac{1}{2}$ lb. per 1,000 cu. ft. for 48 hours was not injured, but double this concentration reduced germination by 10 per cent.

KUWAYAMA (S.). **Supplementary Notes to the Knowledge of the Biology and Natural Enemies of *Lema oryzae* Kuway.** [*In Japanese.*]—*J. Plant Prot* **22** no. 1 pp. 21–26. Tokyo, January 1935.

In Hokkaido rice is attacked during the first half of its development by *Lema oryzae*, Kuw., and though most of the plants recover in late summer, their development is retarded, especially in cool districts, and the yield affected. In 1934 the beetle completed its whole life-cycle on *Zizania latifolia*. The eggs are destroyed by the Staphylinid, *Paederus fuscipes*, Curt. (*idae*, Sharp), and the Coccinellids, *Hippodamia tredecimpunctata*, L., and *Anisosticta novemdecimpunctata*, L., but the last-named only occurs in small numbers.

SAMOGGIA (A.). **L'infestazione acridica nel Lazio durante la primavera e l'estate del 1934.**—*Rev. Roma agric.* **11** no. 12, reprint 7 pp. Rome, 1934. [Recd. April 1935.]

The locust infestation near Rome was considerably less than in the preceding years. Both *Calliptamus italicus*, L., and *Dociostaurus maroccanus*, Thnb., only occurred in small numbers, and the behaviour of the latter suggested that it was represented mainly by the solitary and transitional phases. The scarcity of locusts was apparently mainly due to the success of the previous campaigns, as well as to the activity of parasites (*Mylabris*, *Epicauta rufidorsum*, Goeze (*erythrocephala*, Rossi), *Systoechus*, etc.). The principal control measure adopted was the use of poison baits, which were most effective against the transitional and the solitary phases. Hoppers of the first instar, however, did not take the bait readily, and 4–5 per cent. cresosol [*cf. R.A.E.*, A **21** 124 ; **22** 192] was used against them.

PAPERS NOTICED BY TITLE ONLY.

KOBAYASHI (Kwan-Ichi). **Studies on the Internal Anatomy of the Trypaneidae (Fruit-flies).**—*Trans. nat. Hist. Soc. Formosa* **24** no. 131 pp. 136–149, 3 pls., 3 pp. refs. Taihoku, April 1934. [Recd. February 1935.]

SHIBATA (K.). **On the Effect of Naphthalene upon the Behaviour of Termites.** [*In Japanese.*]—*Trans. nat. Hist. Soc. Formosa* **24** no. 133 pp. 250–255, 4 refs. Taihoku, August 1934. [Recd. February 1935.]

Takahashi (R.). **Another Aphid** [*Astegopteryx taiwana*, sp. n.] **producing Galls on** *Styrax* **in Formosa (Hemiptera).**—*Trans. nat. Hist. Soc. Formosa* **24** no. 134 pp. 312–314, 1 fig. Taihoku, October 1934. [Recd. February 1935.]

Takahashi (R.). **Aphididae of Okinoshima** [including *Myzus lactucicola*, sp. n. on *Lactuca lanceolata*].—*J. Fukuoka nat. Hist. Soc.* **1** no. 3 pp. 243–247, 1 fig. Fukuoka, 1934.

Takahashi (R.). **On the Chinese Species of** *Thoracaphis* [*Nipponaphis*, including a new species], **with Notes on some related Forms (Aphididae, Homoptera).**—*Lingnan Sci. J.* **14** no. 1 pp. 137–141. Canton, 1st January 1935.

Lui (T. F.). **A Report on the Investigation of Native Insecticides** [including *Millettia pachycarpa* (*cf. R.A.E.*, A **23** 117)]. [*In Chinese.*]—*Agric. Inform.* no. 173–174 pp. 104–110. 1934. (Abstr. in *Lingnan Sci. J.* **14** no. 1 p. 208. Canton, 1st January 1935.)

Silvestri (F.). **Descrizione di un nuovo genere di Afidi Callipterini vivente in Italia sull'***Alnus cordata* **Desf.** [*Crypturaphis grassii*, gen. et sp. n.]—*Boll. Lab. Zool. Portici* **28** pp. 290–294, 2 figs. Portici, 25th January 1935.

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(536) Wt. P12/3603 1700 4/35 S.E.R. Ltd. Gp. 353.